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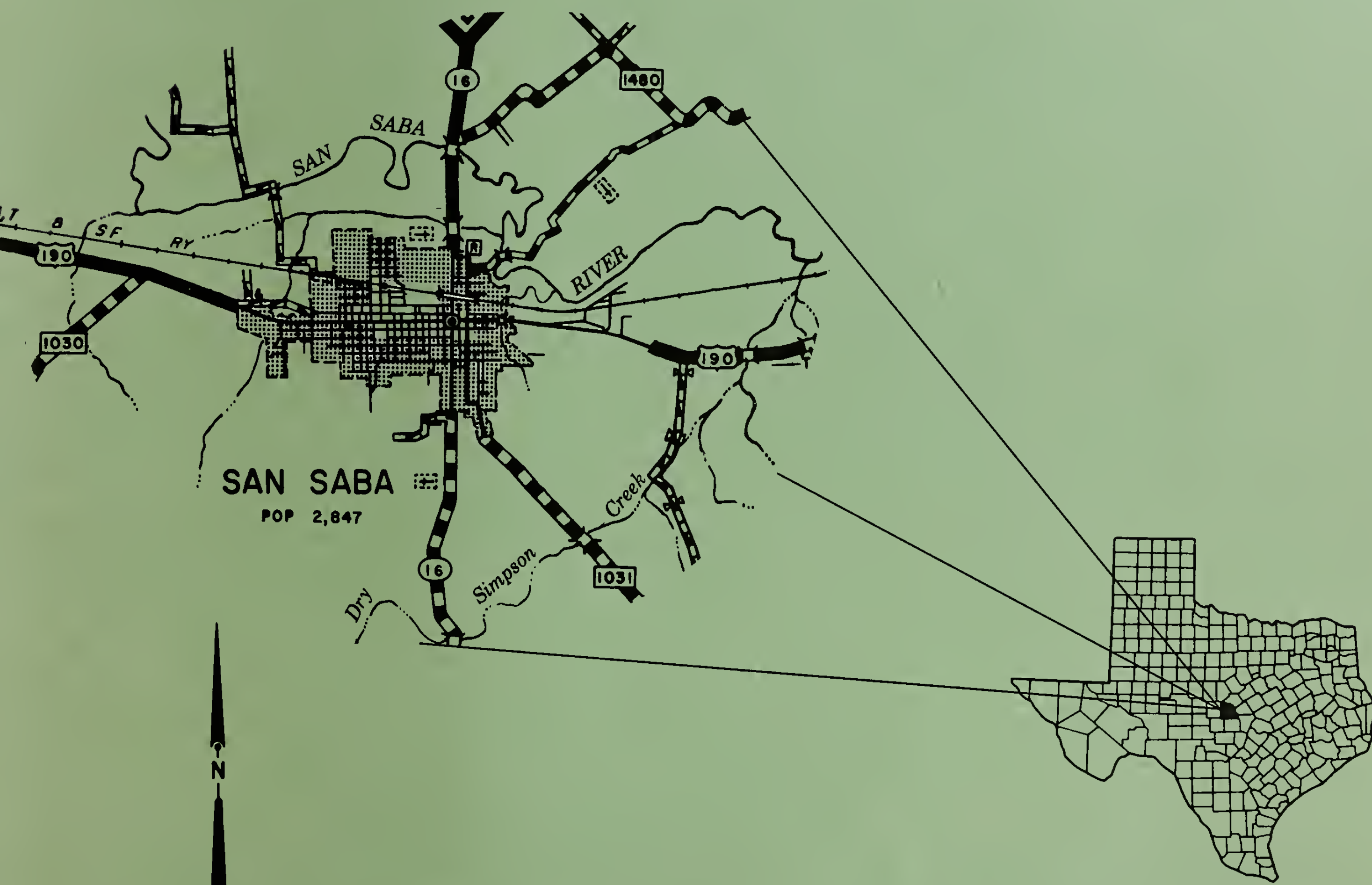
FLOOD PLAIN MANAGEMENT STUDY
SAN SABA COUNTY, TEXAS



Prepared by

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
Temple, Texas

In Cooperation With

SAN SABA-BRADY SOIL AND WATER CONSERVATION DISTRICT
SAN SABA COUNTY COMMISSIONERS COURT
CITY OF SAN SABA
and the
TEXAS WATER COMMISSION
SEPTEMBER 1988

FLOOD PLAIN MANAGEMENT STUDY
DAM SAFETY BREACH ROUTINGS OF CONSTRUCTED DAMS
LOWER SAN SABA RIVER WATERSHED
SAN SABA COUNTY, TEXAS

Prepared by

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FLOOD PLAIN MANAGEMENT STUDY

DAM SAFETY BREACH ROUTINGS OF CONSTRUCTED DAMS

LOWER SAN SABA RIVER

SAN SABA COUNTY, TEXAS

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INTRODUCTION

This flood plain management study report identifies areas of flood plain subject to flooding by the Lower San Saba River within the city of San Saba and vicinity, San Saba County, Texas.

The Lower San Saba River Watershed is a subwatershed of the Middle Colorado River authorized watershed. Planning was completed in December 1956, with construction starting in 1975. The original plan, calling for 12 floodwater retarding structures, was supplemented in 1967 to include four additional structures. Construction was completed in 1980.

In April 1986 the City of San Saba and the San Saba County Commissioners Court passed resolutions requesting, through the Texas Water Commission (TWC), that the Soil Conservation Service (SCS) conduct a flood plain management study and breach analysis on the lower San Saba River Watershed. The San Saba-Brady Soil and Water Conservation District (SWCD) passed a resolution May 15, 1986, concurring in this request and recommended that the SCS make the study.

The City of San Saba, San Saba County, and the San Saba-Brady SWCD will use this study as a factual basis for implementing flood plain management programs to reduce future flood damages.

The study was conducted according to the October 1986 Plan of Work developed and endorsed by the above named requesting entities and the Soil Conservation Service (SCS).

The SCS conducts cooperative flood plain management studies in Texas through the November 1973 Joint Coordination Agreement (Revised 2/86) between the SCS and the Texas Water Commission. SCS assists state agencies and communities in the development, revision, and implementation of their flood plain management programs by carrying out cooperative flood plain management studies (FPMS's) in accordance with Federal Level Recommendation 3 of "A Unified National Program for Flood Plain Management," and Section 6 of the Public Law 83-566. The principles contained in Executive Order 11988, Flood Plain Management, are addressed in this part.

The assistance and cooperation given by the agencies, organizations and individuals during the Lower San Saba River Flood Plain Management Study is greatly appreciated. These include:

San Saba-Brady Soil and Water Conservation District

City of San Saba

San Saba County Commissioners Court

Special appreciation is extended to the individuals who contributed information for the study. Appreciation is also extended to the landowners who permitted access to their property for surveys, photographs, and reconnaissance.

DESCRIPTION OF THE WATERSHED

The study area includes that reach of the San Saba River starting approximately 1/2 mile east of the City of San Saba and extending westerly to approximately 2 miles west of the city.

The San Saba River heads in Sutton County approximately 12 miles northeast of the City of Sonora and flows east to discharge into the Colorado River approximately 8 miles northeast of the City of San Saba. The total watershed encompassed by the lower end of the study area is 3042.7 square miles. The study area is in Geological Survey Hydrologic Unit Number 12090109.

The topography of the watershed is moderately rolling to steep. Elevations range from approximately 2400 feet National Geodetic Vertical Datum (NGVD) in the headwater to approximately 1150 feet NGVD at the lower end of the detailed study area. The study area receives, on the average, 26 inches of rainfall a year. The winters are mild with an average January minimum temperature of 34°F. and the summers are hot with an average July maximum temperature of 96°F.

NATURAL VALUES

CLIMAX VEGETATION

The Lower San Saba River Watershed is located within three Major Land Resource Areas (MLRA). The Edwards Plateau MLRA makes up 52% of the area, while 25% is comprised of the North Central Prairie and 23% of the Central Basin MLRA. The following descriptions of vegetation were compiled using "Soil Survey of San Saba County, Texas", SCS, 1982; and "Texas Plants a Checklist and Ecological Summary", F. W. Gould, TAES publication MP-585, Rev. 1975.

The Edwards Plateau MLRA is considered to be a savannah grassland climax. Woody vegetation exists in motts and scattered stands on upland, and thicker stands in canyons and near escarpments. These include live oak, shin oak, Texas oak, sumacs, mesquite, juniper, and other mixed brush. Grasses included little bluestem, indiangrass, sideoats grama, Texas wintergrass, wildrye, buffalograss and curly mesquite. Numerous perennial and annual forbs are present in the climax plant community.

The North Central Prairie MLRA is a prairie climax dominated by tall and mid grasses. These include big bluestem, little bluestem, indiangrass, switchgrass, Canada wildrye, Texas wintergrass, sideoats grama, vine-mesquite and buffalograss. Various perennial and annual forbs are mixed with the grass cover. Occasional scattered trees and shrubs exist including primarily post oak, blackjack oak, live oak and mesquite.

The Central Basin MLRA supported a savannah grassland climax plant community. Scattered woody vegetation included post oak and live oak as dominants with lesser amounts of juniper, mesquite and various mixed brush species. Grasses included little bluestem, big bluestem, indiangrass, silver bluestem, Arizona cottontop, Texas wintergrass, hooded windmillgrass, sand lovegrass, and sideoats grama. Numerous annual and perennial forbs contributed to the climax plant community.

In all three MLRA's, the creeks and draws supported thicker canopies of woody plants than do the surrounding uplands. THe dominant species included pecan, elm, hackberry, mesquite, black walnut, bur oak and live oak.

Shrubby species considered as mixed brush includes the following: elbowbush, ephedra, bumelia, clematis, greenbriar, littleleaf sumac, skunkbush sumac, flameleaf sumac, kidneywood, catclaw mimosa, catclaw accacia, Roemer acacia, bush honeysuckle, redbud, lotebush, algerita, Texas persimmon, prickly pear, tasajillow, whitebrush and prickly ash.

Perennial forbs that are a part of the climax vegetation include: Engelmanndaisy, orange zexmenia, skeleton plant, bush sunflower, Mexican sagewort, blackfoot, gayfeather, Maxmillian sunflower, goldaster, snoutbean, sensitivebriar, prairie clover, bundleflower, neptunia, tubetongue, dayflower, gaura, ruellia, primrose, indian mallow, globe mallow, sida, winecup, verbena, ironweed, menodora, western ragweed, prairie coneflower, croton, prostrate euphorbia, puccoon, ground cherry, wild onion and rouge-plant.

Annual forbs that are present in climax conditions when favorable moisture conditions exist include filaree, red-seed plantain, bladderpod, coreopsis, thelesperma, gaillardia, bluebonnet, lazy daisy, draba, pepperweed, tansy mustard, wild carrot, broomweed, deer vetch, burclover, phlox, mountain pink, paintbrush, eryngo, henbit, basketflower, false ragweed, husiache-daisy and brown-eyed susan.

LAND USE

The Lower San Saba River Watershed includes 561,920 acres. The current land use estimates are shown in Table 1.

TABLE 1
PRESENT LAND USE
LOWER SAN SABA RIVER

Land Use	Acres	Percent of Watershed
Rangeland	459,077	81.7%
Cropland	64,000	11.4%
(dryland)	(50,000)	
(irrigated)	(14,000)	
Pastureland	18,800	3.3%
(dryland)	(18,050)	
(irrigated)	(750)	
Urbanland	11,625	2.1%
Orchards	7,520	1.3%
(dryland)	(1,895)	
(irrigated)	(5,625)	
Impounded Water	898	0.2%
Total	561,920	100%

1. Rangeland is by far the dominant land use in the watershed. Medium sized ranches are the predominant enterprises utilizing rangeland. The current vegetation has changed considerably from the climax vegetation described previously. These changes are thought to be the result of yearlong and often heavy grazing by livestock including cattle, sheep and goats and the resulting decrease in the periodic widespread range fires.

Current range conditions generally consist of only about 25-45% of the kind and amount of plants that made up the climax vegetation. Taller, deeper rooted grasses and forbs were gradually replaced by shorter, shallower rooted grasses and forbs. Grasses that have decreased generally include little bluestem, big bluestem, indiangrass, Canada wildrye, vine-mesquite and Arizona cottontop. These have been replaced over most of the watershed by increases in grasses such as curlymesquite, silver bluestem, threeawns, slim tridens, Texas grama, Texas wintergrass and dropseeds. Forbs such as Engelmanndaisy, bushsunflower, orange zexmenia, bundleflowers, snoutbeans, sensitivebriar, daleas and sagewort have decreased with the past grazing management. Forbs which have increased include ragweed, crotons, horehound, prairie coneflower, mealycup sage, twinleaf senna, nightshade, milkweed and broomweed.

The semi-open savannahs and prairies have changed to a brush dominated landscape. Examples of woody species that have increased in density include mesquite catclaw acacia, catclaw mimosa, prickly pear, tasajillo, Texas persimmon, algerita, lotebush, whitebrush, Ashe juniper and pricklyash.

Controlling moderate to thick brush is routinely practiced by landowners in an attempt to increase grass production and make livestock management easier. Mechanical and chemical methods as well as prescribed burning and biological control with goats are all used to decrease brush densities. Reseeding is sometimes done in conjunction with mechanical brush control.

2. Pastureland, where single species of grasses, often introduced are managed for high production, is scattered throughout the watershed in the deeper soils. Grasses managed as pastureland include coastal bermudagrass, kleingrass, Wilman lovegrass, weeping lovegrass, switchgrass and several of the introduced bluestems. Weed control and periodic fertilization are used to maintain high production for grazing or hay production.

3. Cropland is primarily small grain, grain sorghum and forage sorghum. Some peanuts are grown in the sandy soils of the Central Basin MLRA. Very small amounts of cotton may be grown periodically. Wheat and oats are usually grazed early and then allowed to make grain for harvest. Forage sorghum is either grazed or cut for hay.

4. Orchards, primarily pecan, are scattered throughout the deeper bottomland soils of the San Saba River and its major tributaries. A few small fruit orchards, primarily peach, exist in the sandy textured upland soils.

5. Impounded Water consists of 687 farm ponds covering about 443 acres and 16 floodwater retarding structures covering about 445 acres.

6. Urban areas are composed primarily of the towns of San Saba and Richland Springs. Numerous small communities, roads and parks also contribute to urban land acreage.

PRIME FARMLAND SOILS

Prime farmland soils are those soils that are best suited to producing crops. These soils have the quality, growing season and moisture supply needed to produce a sustained high yield of crops. Prime farmland soils generally have an adequate and dependable supply of moisture from precipitation or irrigation. They have an acceptable level of acidity or alkalinity, few or no rocks, and are permeable to water and air. These soils are not excessively erosive or saturated with water for long periods. Prime farmland soils include those already being farmed and those in pastureland and rangeland that meet prime farmland criteria. Urbanland and water areas are not considered prime farmland.

There are an estimated 130,700 acres of prime farmland soils in the watershed which comprises 23% of the total watershed acreage. The following list is presented of prime farmland soils by MLRA. Inadequate rainfall is a limitation on some soils. These soils qualify as prime farmland if this limitation is overcome by irrigation.

Edwards Plateau
- Blanket clay loam
- Frio clay loam, occasionally flooded
- Karnes loam
- Krum silty clay
- Luckenbach clay loam
- Nuvalde clay loam
- Rowena clay loam
- Sagerton clay loam
- Salga clay loam
- Tabosa clay
- Valvera clay, silty clay

North Central Prairie
- Bastrop fine sandy loam
- Blanket clay loam
- Bosque loam
- Clairmont silt loam
- Frio silty clay loam, occasionally flooded
- Knippa silty clay
- Leeray clay
- May fine sandy loam
- Miles fine sandy loam
- Miller silty clay
- Pedernales fine sandy loam
- Randall clay
- Rochelle fine sandy loam
- Sagerton clay loam
- Uvalde clay loam
- Weswood silt loam
- Winters fine sandy loam

Central Basin
- Demona loamy sand
- Hye fine sandy loam
- Menard fine sandy loam, loam
- Nimrod fine sandy loam
- Pedernales fine sandy loam
- Pontotoc fine sandy loam

WILDLIFE AND FISH

The watershed provides the habitat needs of a great variety and abundance of wildlife and fish. This diversity of wildlife is of great value ecologically, aesthetically and economically. Each animal fills a necessary niche in the complex balance of nature and is dependent upon and essential to other plants and animals.

1. Mammals. There are at least 42 different species of native mammals that inhabit the watershed according to "The Mammals of Texas" by William Davis, TPWD Bulletin 41, Rev. 1974. Nine kinds of bats live in the watershed. The ranges of 18 species of native rodents include the watershed. These include 9 species of mouse, several squirrels, prairie dog, pocket gopher, beaver, cotton rat, wood rat and porcupine. Three kinds of rabbits, opossum and armadillo are also found. The only native species of big game is the white-tailed deer. There are an estimated 32,000 deer in the watershed, with the highest densities in the Central Basin area and the lowest in the North Central Prairies. Eight species of native carnivore inhabit the watershed including raccoon, ringtail cat, striped skunk, badger, grey fox, coyote, bobcat and cougar. The more important kinds of predators in this group are grey fox, bobcat and coyote. Introduced wild mammals include nutria, roof rat, Norway rat, house mouse, red fox, feral hog, axis deer, fallow deer, sika deer, blackbuck antelope, mouflon sheep and auodad sheep. Mammals, once known to inhabit the watershed area included black bear, bison, pronghorn antelope, javelina and red wolf.

2. Birds. Of the estimated 540 birds that have been recorded in Texas, about 330 occur in or near the watershed. Only the more common kinds will be listed. Birds associated primarily with ponds, rivers, creeks and wet areas include pied-billed grebe, cormorant, great blue heron, cattle egret, green heron, blue-winged teal, green-winged teal, pintail, shoveler, gadwall, widgeon, bufflehead, coot, sandhill crane, killdeer, yellowlegs, several sand pipers, curlew, dowitcher, snipe, ring-billed gull, black tern, belted kingfisher and red-winged

blackbird. Birds found more commonly in upland areas include turkey vulture, red-tailed hawk, marsh hawk, kestrel, turkey, bobwhite quail, inca dove, mourning dove, barn owl, great horned owl, roadrunner, nighthawk, hummingbird, several woodpeckers, several flycatchers including scissortail and western kingbird, horned lark, purple martin, barn swallow, bluejay, raven, titmouse, several wrens, bluebird, robin, mockingbird, thrasher, loggerhead shrike, starling, Bell's vireo, several warblers, cardinal, painted bunting, numerous sparrows, meadowlark, grackel, orchard oriole, house finch, goldfinch and cowbirds.

3. <u>Reptiles and Amphibians</u>. The actual number of species from these groups that inhabit the watershed is unknown; however, the more commonly seen ones are listed. Turtles include box turtle, red-eared slider, snapping turtle and softshell turtle. Lizards include collard lizard, earless lizard, fence lizard, tree lizard, horned lizard, six-lined racerunner and Great Plains skink. Among the snakes are included hognose snake, coachwhip, bullsnake, racer, common kingsnake, green snake, milk snake, rat snake, common water snake, garter snake, ribbon snake, coral snake, diamond-backed rattlesnake, copperhead and water moccasin. Among the common amphibians are the tiger salamander, woodhouse toad, spadefoot toad, leopard frog and bullfrog.

4. Fish. A number of fish inhabit the San Saba River and the perennial creeks that flow into it. Among the smaller fish that are less obvious are species from the following groups: killifish, mosquito fish, silversides, shiners, darters, minnows and redhorse. Species which are more obvious include largemouth bass, smallmouth bass, warmouth, 5 kinds of sunfish including green bluegill, redear, longear and yellowbelly, channel catfish, flathead catfish, yellow and black bullhead, freshwater drum, gizzard shad, gar, river carpsucker, buffalo, carp, white crappie and striped bass. The numerous ponds in the watershed are commonly stocked with fish for recreational fishing. This most often includes channel catfish, blue catfish, fathead minnow, largemouth bass, bluegill sunfish and golden shiner.

WETLANDS

Several types of wetlands occur in the watershed as described by U. S. Fish and Wildlife Service Circular 39, "Wetlands of the United States." The most prevalent kind of wetland is the inland open fresh water or Type 5. These are ponds and reservoirs usually less than 10 feet deep fringed by a border of emergent vegetation. Aquatic vegetation in the shallow water includes muskgrass, pondweeds and watermilfoil. There are an estimated 380 of these wetlands covering about 725 acres in the watershed.

There are also some seasonally flooded basins or Type 1 wetlands. These are primarily old, silted in farm ponds that are only temporarily covered with water. These and some natural depressions dry up periodically in periods of low runoff.

These shallow basins may or may not develop wetland vegetation due to duration and frequency of inundation and grazing management. There are an estimated 323 of these wetlands covering 173 acres.

Some inland fresh meadows or Type 2 wetlands also exist in the watershed. These areas are usually without standing water, but the soils are waterlogged most of the time. These wetlands generally occur in and adjacent to broad water courses with spring flow or high water tables and without well developed channels. Vegetation typically includes sedges, spikerushes, dock, bushy beardgrass and giant ragweed.

THREATENED AND ENDANGERED SPECIES

Several vertebrate animals which are listed as either endangered or threatened are found in the watershed or could be expected to be found. The following chart lists those species and the organizations that consider them to be either threatened (T) or endangered (E).

	ORGANIZATION	LISTING	STATUS
Animal	USFWS	TPWD	TOES
Arctic Perigrine Falcon	T	E	E
Bald Eagle	E	E	E
Whooping Crane	E	E	E
Interior Least Tern	E	E	E
Wood Stork	E	T	
Black-capped Vireo		T	
Golden-cheeked Warbler		T	T
Prairie Falcon			T
Merlin			T
Texas Horned Lizard		T	T
Mexican Milk Snake		T	T

The organizations and the documents listing status are as follows: USFWS - "Endangered and Threatened Wildlife and Plants," U. S. Fish and Wildlife Service, 50 DFR 17.11 & 17.12, April 10, 1987; TPWD -
TOES - Endangered, Threatened, and Watch Lists of Vertebrates of Texas, Texas Organization of Endangered Species, Publication 4, March 1984;

All of the birds listed are considered to be migrants whose migration route passes through the watershed. The black-capped vireo and golden-cheeked warbler are also migratory, but their nesting range includes at least a portion of the watershed. The Texas horned lizard and Mexican milk snake are reptiles whose range includes the watershed.

Additionally, two animals on the USFWS threatened and endangered list are known to occur in three of the counties that make up part of the watershed but which do not occur in the watershed. The Concho water snake is listed for San Saba and McCullough County, but its known range in these counties is restricted to the Colorado River, primarily upstream from its confluence with the San Saba River. The Clear Creek gambusia is listed for Menard County, but is restricted to a small spring-fed pool at the head of Clear Creek which is a tributary of the Upper San Saba River, upstream from the Lower San Saba River Watershed.

PROCEDURES FOR ANALYSIS

SCS hydrologic and hydraulic procedures were used in this study. Detailed field surveys were made of all cross sections. Original surveys used in planning of the structures were also used. In addition, several cross sections provided by the Corps of Engineers were used in the analysis.

The SCS computer model, WSP2, was used to develop the hydraulic characteristics of the valley. This model develops a series of water surface profiles, defining the stage-discharge relationship throughout the valley.

The hydrology of the watershed was developed using the Unit Hydrograph method contained in the SCS Model TR-20, Hydrology.

The methodology presented in the SCS Technical Release TR-66 was used in the breach analysis of each dam. A 100-year, 48-hour storm was used in the breach analysis.

FLOOD PROBLEMS

The objective of this study was twofold: (1) Identify and describe the potential flood impact areas under present conditions, and (2) identify and describe the potential flood impact areas should one of the 54 flood prevention reservoirs above the City of San Saba breach. The potential flood impact areas provide a basis for the sponsors to limit future liability. Identification of the flood impact areas will also enable sponsors to prepare emergency action plans.

Although very little development has taken place in the immediate area adjacent to the San Saba River channel, the City of San Saba is located such that many homes and commercial buildings would be adversely affected by floods caused by rainfall or structure breach. This study provides the information needed by the sponsors to take steps to avoid a major catastrophe should either a major riverine flood or structure breach occur.

The City of San Saba has experienced rather frequent flooding in the northern and eastern part of the city around the city cemetery and baseball field areas. Should a 100-year storm, 500-year storm or major structure breach occur, more flooding will occur than has been experienced in the past. This flood plain management study accurately defines the existing flood hazard areas so that the people of San Saba can implement land use and development programs consistent with the identified flood hazards.

Following is a tabulation of the acreage of rural and urban areas subject to inundation by the 100-year flood, 500-year flood and the structure breach flood from Brady Reservoir:

TABLE 2
FLOODED AREAS
LOWER SAN SABA RIVER
FLOOD PLAIN MANAGEMENT STUDY

	Rural Acres	Urban Acres	Total Acres
Within the 100-year flood plain	2050	234	2284
Within the 500-year flood plain	2369	395	2764
Within the structure breach flood plain	1846	124	1970

Potential flood heights for the 100-year and 500-year floods are shown on pages 19-20, Figures 1-4, to illustrate the flood problems. Upstream flood plain and watershed land use changes anticipated by local officials within the next 10-15 years are not expected to significantly affect future elevations on the flood plains of the study area.

The City of San Saba is presently in the emergency flood insurance program; however, no previous detailed flood insurance study has been made.

This flood plain management study will provide the factual basis needed to convert the city to the regular flood insurance program.

FIGURE 1 - Potential flood heights on cross section 2 at U. S. Highway 190.

FIGURE 2 - Potential flood heights at the intersection of High Street (State Highway 16) and Pecan Street in the City of San Saba.

FIGURE 3 - Potential flood heights at the south end of the State Highway 16 bridge over the San Saba River. (Note: 100-year flood is 1.7 feet below road surface.)

FIGURE 4 - Potential flood heights at the intersection of Lewis Street and 9th Street in the City of San Saba.

EXISTING FLOOD PLAIN MANAGEMENT

The 61st Texas Legislature in 1969 enacted the Texas Flood Control and Insurance Act, Article 8280-13 VACS, and Article 1581e-1 VACS. Article 8280-13 named the Texas Water Development Board and the State Board of Insurance as the responsible state-level agencies in respect to the National Flood Insurance Program. In 1985, the 69th Texas Legislature created the Texas Water Development Board and the Texas Water Commission from the Texas Department of Water Resources. Article 8280-13 was codified in Texas Water Code (Subchapter I, Section 16.311), and responsibility for the flood insurance program in Texas was assigned to the Texas Water Commission and the State Board of Insurance. Subchapter I, Section 16.315 of the Code authorizes all political subdivisions, including cities, counties and many types of special purpose districts and authorities, to take all necessary and reasonable actions to comply with the requirements and criteria of the National Flood Insurance Program.

At the present time, state-level statuatory control on use and management of flood hazard areas are fairly limited. Subchapter G, Section 16.236 of the Texas Water Code, requires the Texas Water Commission or the local political entity to approve plans for any levee or other such improvement which may change floodflows of any stream in Texas that is subject to floods. This state program will utilize state agency rules and regulations calling for evaluation of flood hazards and will conform to the minimum flood plain management criteria established by the Federal Emergency Management Agency for the National Flood Insurance Program.

ALTERNATIVES FOR FLOOD PLAIN MANAGEMENT

PRESENT CONDITIONS

Fifty-four floodwater retarding structures built in the Brady Creek and Lower San Saba River Watersheds protect the study area. These structures provide excellent protection; however, since it is virtually impossible to completely stop all flooding, there are areas within the study area that are still subject to the rarer floods. A breach of Brady Reservoir would also impact heavily on some regions within the study area. Since flood hazard area maps have not been available prior to this study, the development that has taken place within the flood plain has been done with very little regard to possible future flood damage.

LAND TREATMENT

Effective conservation land treatment is presently being carried out by land users in the watershed. Excess runoff or erosion and sedimentation due to lack of conservation land treatment is not a major cause of flooding.

PRESERVATION AND RESTORATION OF NATURAL VALUES

Since the primary natural value of the study area flood plain is its ability to transport floodwaters, encroachment onto the flood hazard areas of the flood plain with obstacles which interfere with the movement of floodwater should be avoided to preserve its present flowage capacity.

Nonprime farmland soils should be used for construction sites and other non-farm uses rather than prime farmland. Information on prime farmland soils in the study area may be obtained from the Soil Conservation Service Office at San Saba, Texas.

NONSTRUCTURAL MEASURES

Nonstructural measures which will help reduce or minimize flood losses include flood proofing, flood warning systems, relocation, zoning regulations, participation in the national flood insurance program, emergency preparedness and building or development codes.

Flood proofing can reduce flood damages by a combination of structural provisions and changes or adjustments to properties subject to flooding. Examples of flood proofing are sealing low window and door openings and modifying floor drains to prevent the entrance of flood waters.

Flood warning systems should be coordinated with local disaster plans. The National Weather Service issues warnings of potential flood producing storms. Staff gages set at key locations can be monitored to give advance warnings. A float-activated electronic signal could be connected to the local police or fire station for monitoring.

Relocation involves permanent evacuation of developed areas subject to inundation, acquisition of lands by purchase, removal of improvements and relocation of the population from such areas. Such lands could be used for parks or other purposes that would not suffer large damages and would not interfere with floodflows.

Zoning is a legal method used to implement and enforce the details of the flood plain management program, to preserve property values and to achieve the most appropriate and beneficial use of available land. Clear, concise and thorough zoning bylaws with enforcement of the bylaws are essential to make zoning effective.

Flood insurance was established by the National Flood Insurance Act of 1968 (Public Law 90-448, as amended) to make limited amounts of flood insurance, which were previously unavailable from private insurers, available to property owners and occupiers. The Flood Disaster Protection Act of 1973 (Public Law 93-234, as amended) was a major expansion of the National Flood Insurance Program.

Flood insurance is available through local insurance agents and brokers only after a local governing body applies and is declared eligible for the program by the Federal Insurance and Hazard Mitigation Division of the Federal Emergency Management Agency (FEMA). Adoption and enforcement of a local flood prevention ordinance which meets FEMA minimum flood plain management criteria is necessary to qualify and maintain eligibility.

Emergency preparedness consists of a plan by local officials to be put into effect in the event of flooding. Procedures are worked out and personnel designated to implement the plan. Methods and procedures to alert and warn the populace of possible flooding are developed. High risk areas and handicapped elderly or other persons known to need help during evacuation are located and identified. Plans are made for their evacuation or rescue. Shelters are provided to evacuees.

Building codes are developed to set up minimum standards for controlling the design, construction and quality of materials used in buildings and structures within a given area to provide safety for life, health, property and public welfare. Building codes can be used to minimize structural and subsequent damages resulting from inundation. Building restriction codes can:

1. Specify adequate anchorage to prevent flotation of buildings from their foundations.

2. Establish basement elevations and minimum first-floor elevations in accordance with potential flood heights.

3. Prevent virtually all damage by elevating the foundation and prohibiting basements in those areas subject to very shallow and frequent flooding.

4. Require building reinforcement to withstand water pressure or high velocity flow and restrict the use of materials which deteriorate rapidly in the presence of water.

5. Prohibit equipment that might be hazardous to life when submerged. This includes chemical storage, boilers and electrical equipment.

Development policies which are designed to prevent construction of streets and utility systems in flood prone areas tend to slow development of the flood plains.

FLOOD HAZARD MAPS

The index map (Appendix, page 6) shows the stream reach covered by each of the photomaps. The index map also shows the watershed boundaries and stream reaches studied.

The limits of the 100-year and 500-year floods, for present conditions, were delineated on aerial photographs (Appendix, page 7 to 21) to indicate the area inundated. The 10-year and 50-year frequency floods for present conditions could not be effectively shown on the aerial photographs due to the map scale and topography. The flood lines shown are based on field surveys of roads, bridges and valley sections used in conjunction with Geological Survey topographic maps having 10-foot contour intervals, and interpretation of aerial photographs. These maps should only be used to determine the approximate boundaries of the flooded areas. Actual dimensions measured on the ground may vary slightly from those measured on the photomaps of this report due to map scale and reproduction limitations. The water surface profile elevations should be used to determine actual on the ground dimensions.

The limits of the Brady Reservoir breach were also determined. The areas affected by a breach of this structure is shown on aerial photographs (Appendix pages 32 to 46).

Analyses were made without showing the effects of potential obstructions. Debris may collect at bridges and culverts and clog the channels during major floods and increase the depth of flooding. Also, extremely rare events such as catastrophic storms were not analyzed.

TECHNICAL APPENDIX

A technical appendix is included in this report. The index map, flood hazard area photomaps and flood profiles are included in the appendix. The index map shows the study area coverage of individual flood hazard area maps and the watershed boundaries (Appendix, page 6).

The water surface profiles of the San Saba River show the profiles of the 10-year, 50-year, 100-year, and 500-year floods for present conditions. Included on the profiles are stream elevations of the channel bottom, pertinent bridge and roadway data and other location data. The stationing of profile is bank-full stream channel distance, in feet, and is measured from the 1983 flight of aerial photomaps. Flood depths can be estimated at any location on the stream reach from the water surface profiles. The water surface profiles of the San Saba River are included in the Appendix, pages 22 to 30. An index is included in the Appendix, page 5 to assist the user in relating the flood hazard area photomaps to the appropriate water surface profile.

Cross sections, representative of the streams studied, have been plotted to illustrate the shape of that stream and its flood plain. The 10-year, 50-year, 100-year and 500-year floodwater surface elevations are shown on the plotted cross section to illustrate the effect of various flood depths (see Appendix, page 31).

The elevations, discharges and flood plain width of the 10-year, 50-year, 100-year, 500-year and Brady Reservoir breach floods at surveyed cross sections are shown in Appendix Tables 3 and 4. Each cross section is listed by number on this table. Each cross section is also identified by number on flood hazard area photomaps. The user can locate a cross section on the photomap, turn to Table 3 or 4, (Appendix, pages 56-57) and read the discharge, elevation and flood plain width directly from the table.

Also, included in the Appendix is Table 5, a list of elevation reference marks showing the elevation and location of each. Additional data are on file in the USDA Soil Conservation Service State Office, W. R. Poage Federal Building, 101 South Main Street, Temple, Texas 76501-7682.

GLOSSARY

Breach - A break in the embankment which causes a sudden release of water stored in the reservoir.

Channel - A natural stream that conveys water; a ditch or channel excavated for the flow of water.

Channel Bottom - The elevation of the deepest part of a stream channel at a particular cross section.

Flood - An overflow or inundation that comes from a river or other body of water and causes or threatens damage.

Flood Frequency - A means of expressing the probability of flood occurrences as determined from a statistical analysis of representative stream flow or rainfall and runoff records. A 10-year flood occurs, on the average, once in 10 years (a ten percent change of being exceeded in any given year). A 50-year flood occurs, on average, once in 50 years (a two percent chance of being exceeded in any given year). A 100-year flood occurs, on the average, once in 100 years (a one percent change of being exceeded in any given year). A 500-year flood occurs, on the average, once in 500 years (a 0.2 percent of being exceeded in any given year).

Flood Peak - The highest value of the stage or discharge attained by a flood, thus, peak stage or peak discharge.

Flood Plain - 1. Nearly level land situated on either or both sides of a channel which is subject to overflow flooding. 2. Lowland and relatively flat alluvial areas adjoining inland and coastal waters (streams, bays, etc.), including flood-prone areas of off-shore islands.

500-Year Flood Plain - The land that would have a 0.2% chance of being flooded in any given year.

100-Year Flood Plain - The land that would have a 1.0% chance of being flooded in any given year.

Flood Stage - The stage at which overflow of the natural banks of a stream causes damage in the reach in which the elevation is measured.

Runoff - That portion of the precipitation on a drainage area that is discharged from the area in stream channels; types include surface runoff, groundwater runoff or seepage.

Water Surface Profile - A graph showing the relationship of water surface elevation to stream channel location for a specific flood event.

Watershed - All land and water within the confines of a drainage divide.

Watershed Boundary - The divide separating one drainage basin from another.

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APPENDIX

APPENDIX

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TECHNICAL APPENDIX

This Technical Appendix to the Lower San Saba River Flood Plain Management Study (FPMS) and Dam Breach Analysis is a compilation of the FPMS technical findings. It includes the photomap index, flood hazard and breach inundation photomaps, flood profiles, plottings of typical stream cross sections, elevation and discharge tabulations and a listing of pertinent elevation reference marks. Other technical data developed during this study are on file in the USDA Soil Conservation Service State Office, W. R. Poage Federal Building, 101 South Main Street, Temple, Texas 76501-7682.

INVESTIGATIONS AND ANALYSES

FIELD SURVEYS

Topographic data were obtained from Geological Survey topographic maps and field surveys. Engineering surveys were made of cross sections selected to represent the stream hydraulics and flood plain areas (refer to the sheet of typical valley cross sections, Appendix page 31). Elevations appearing in this report are based on mean National Geodetic Vertical Datum of 1929. Temporary elevation reference marks were established by the Soil Conservation Service in 1987. Table 5 Appendix, pages 58 to 61, shows the listings, descriptions, and location of permanent and temporary elevation reference marks.

HYDROLOGIC AND HYDRAULIC METHODS

The watershed boundaries were determined by use of Geological Survey topographic maps. Hydrologic evaluations were based on synthetic frequency methods. Rainfall frequency data were obtained from Weather Bureau Technical Paper No. 40, Rainfall Frequency Atlas of the United States. Values greater than the 100-year frequency event were determined by extrapolation of the rainfall versus frequency graph. Peak discharge values were determined by flood routing various storm frequencies with a 48-hour rainfall duration using SCS Technical Release No. 20, A Computer Program for Project Formulation, Hydrology. The program computes surface runoff resulting from any synthetic or natural rainstorm. The program will route the flow through stream channels and reservoirs. Results include, but are not limited to, a combination of the routed hydrograph with those from other tributaries and a printout of the peak discharges, their time of occurrence, and the water surface elevations for each computed discharge at any desired cross section or structure.

From the representative stream and road cross sections, water surface profiles were developed by the Modified Slope Area Method. The effects of bridges and culverts on the stream hydraulics were determined by use of the Bureau of Public Roads (BPR) Method. Computations were made using SCS's "WSP2, A Computer Program for Determining Flood Elevations and Flood Areas for Certain Flow Rates." Peak discharges obtained from TR-20 were run through WSP2 to determine the resulting water surface profile for each flood analyzed.

Breach routings were done on five dams in the vicinity of San Saba. These dams were the Brady Reservoir, Lower San Saba River Sites 13A, 14A, 15 and 16. Because of their distance from the study area and their relatively small size, the breach discharge hydrographs from the four Lower San Saba River sites were sufficiently attenuated so that the remaining discharge would safely pass within the channel of the San Saba River. Therefore, no water surface profiles or photomaps are presented showing this data. It was assumed that the remaining 48 small sites above the study area would produce similar results. Due to its large volume of storage, the Brady Reservoir breach hydrograph had sufficient peak and volume to inundate area outside of the channel of the river. The resulting water surface profile and area inundated are presented in the Appendix following the narrative data. All breach analysis was done with the Soil Conservation Service "Computer Program for Simplified Dam-Breach Routing Procedure".

FLOOD HAZARD EVALUATION

The 500-year and 100-year flood hazard areas are outlined on aerial photographs obtained from the January 1983 Agricultural Conservation and Stabilization Service flight. The flood hazard area boundaries were developed by plotting the computed water surface elevations on the surveyed cross sections and transposing this information to the aerial photographs. The flood hazard areas between the surveyed cross sections were developed through interpretation of Geological Survey topographic maps and the aerial photographs in conjunction with the surveyed cross sections. Actual flood

limits may vary slightly on the ground from the outlined areas on the photomaps due to map scale and reproduction limitations. For this reason, the water surface elevations from the flood profiles should be used for determining site specific potential flood depths.

INVENTORY OF NATURAL VALUES

The natural values of the study area flood plain were determined by the Soil Conservation Service, State Conservationist's staff biologist through on-the-ground reconnaissance, interviews of local people and literature search.

PUBLIC PARTICIPATION

The Lower San Saba River Flood Plain Management Study Plan of Work was developed through consultation with the local officials and study endorsers.

A public meeting was held during preparation of the report draft in order to get public input and participation.

MANAGEMENT ALTERNATIVES

Nonstructural management alternatives were considered during the flood plain management study and discussed during meetings with local public officials and other interested members of the public. Those considered to have merit and worthy of further study for possible implementation were put in the report.

INDEX
TO
PHOTOMAPS
AND
WATER SURFACE PROFILES
LOWER SAN SABA RIVER
FLOOD PLAIN MANAGEMENT STUDY
SAN SABA COUNTY, TEXAS

Cross Section Number	Photomap Sheet Number	Water Surface Profile Sheet Number
	San Saba River	
1	1, 2, 4, 5	1
2	1, 4, 5, 6	1
3	4, 5, 6	1
4	5, 9	2
5	4, 5, 6, 9, 10	3
6	3, 4, 5, 6, 8, 9, 10	4
7	3, 4, 5, 6, 8, 9, 10	4
8	3, 4, 5, 6, 8, 9, 10	4
9	3, 7, 8, 9, 10	4
10	7, 8, 9, 10, 11, 12, 13	5
11	7, 8, 9, 10, 11, 12, 13	6
12	7, 11, 12	6
13	11, 12, 13	6
14	11, 12	7
15	14, 15	9

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LEGEND

- TOWN
- FEDERAL HIGHWAY
- STATE HIGHWAY
- COUNTY HIGHWAY
- CITY LIMIT
- RAILROAD
- DRAINAGE
- STREAM REACH STUDIED
- 15 SHEET COVERAGE

VICINITY MAP

INDEX MAP

FLOOD PLAIN MANAGEMENT STUDY

STUDY AREA

SAN SABA RIVER

SAN SABA COUNTY
TEXAS

0 1 2 MILES

0 1 2 KILOMETERS

SOURCE
1986 GENERAL HIGHWAY MAP AND
INFORMATION FROM SCS FIELD PERSONNEL
POLYCONIC PROJECTION

LEGEND

100 YEAR FLOOD HAZARD AREA
500 YEAR FLODO HAZARD AREA
AREA OF SHALLOW FLOODING
CROSS SECTION LOCATION
STREAM CHANNEL
ELEVATION REFERENCE MARKS
15000 CHANNEL STATION

SCALE 0 400 800 FEET
0 100 200 METERS
APPROXIMATE

DUE TO INHERENT AERIAL PHOTOGRAPHIC DISPLACEMENT, THE PHOTOGRAPHIC IMAGE MAY VARY FROM TRUE GROUND LOCATION

1983 HAP PHOTOGRAPHY

SHEET 1 OF 15

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SAN SABA RIVER
FLOOD PLAIN MANAGEMENT STUDY
SAN SABA COUNTY, TEXAS

FLOOD HAZARD AREA
SAN SABA RIVER

JUNE 1987 4-R-40093

LEGEND

100 YEAR FLOOD HAZARD AREA	CROSS SECTION LOCATION	15000 → CHANNEL STATION
500 YEAR FLOOD HAZARD AREA	STREAM CHANNEL	
AREA OF SHALLOW FLOODING	× ELEVATION REFERENCE MARKS	

SCALE 0 400 800 FEET; 0 100 200 METERS; APPROXIMATE

DUE TO INHERENT AERIAL PHOTOGRAPHIC DISPLACEMENT, THE PHOTOGRAPHIC IMAGE MAY VARY FROM TRUE GROUND LOCATION

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FLOOD HAZARD AREA

SAN SABA RIVER

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JUNE 1987 4-R-40093

LEGEND

100 YEAR FLOOD HAZARD AREA	CROSS SECTION LOCATION	15000 → CHANNEL STATION
500 YEAR FLOOD HAZARD AREA	STREAM CHANNEL	
AREA OF SHALLOW FLOODING	× ELEVATION REFERENCE MARKS	

SCALE 0 400 800 FEET
0 100 200 METERS
APPROXIMATE

DUE TO INHERENT AERIAL PHOTOGRAPHIC DISPLACEMENT, THE PHOTOGRAPHIC IMAGE MAY VARY FROM TRUE GROUND LOCATION

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LEGEND

100 YEAR FLOOD HAZARD AREA

500 YEAR FLOOD HAZARD AREA

AREA OF SHALLOW FLOODING

CROSS SECTION LOCATION

STREAM CHANNEL

ELEVATION REFERENCE MARKS

15000 CHANNEL STATION

SCALE 0 400 800 FEET
0 100 200 METERS
APPROXIMATE

DUE TO INHERENT AERIAL PHOTOGRAPHIC DISPLACEMENT, THE PHOTOGRAPHIC IMAGE MAY VARY FROM TRUE GROUND LOCATION

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SAN SABA RIVER

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LEGEND

100 YEAR FLOOD HAZARD AREA
500 YEAR FLOOD HAZARD AREA
AREA OF SHALLOW FLOODING
CROSS SECTION LOCATION
STREAM CHANNEL
ELEVATION REFERENCE MARKS
15000 —— CHANNEL STATION

SCALE 0 400 800 FEET
0 100 200 METERS
APPROXIMATE

DUE TO INHERENT AERIAL PHOTOGRAPHIC DISPLACEMENT, THE PHOTOGRAPHIC IMAGE MAY VARY FROM TRUE GROUND LOCATION

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SAN SABA RIVER

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LEGEND

100 YEAR FLOOD HAZARD AREA

500 YEAR FLOOD HAZARD AREA

AREA OF SHALLOW FLOODING

CROSS SECTION LOCATION

15000 CHANNEL STATION

STREAM CHANNEL

ELEVATION REFERENCE MARKS

SCALE 0 400 600 FEET
0 100 200 METERS
APPROXIMATE

DUE TO INHERENT AERIAL PHOTOGRAPHIC DISPLACEMENT, THE PHOTOGRAPHIC IMAGE MAY VARY FROM TRUE GROUND LOCATION

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LEGEND

100 YEAR FLOOD HAZARD AREA	CROSS SECTION LOCATION
500 YEAR FLOOD HAZARD AREA	STREAM CHANNEL
AREA OF SHALLOW FLOODING	× ELEVATION REFERENCE MARKS

15000 —— CHANNEL STATION

SCALE 0 400 800 FEET; 0 100 200 METERS; APPROXIMATE

DUE TO INHERENT AERIAL PHOTOGRAPHIC DISPLACEMENT, THE PHOTOGRAPHIC IMAGE MAY VARY FROM TRUE GROUND LOCATION

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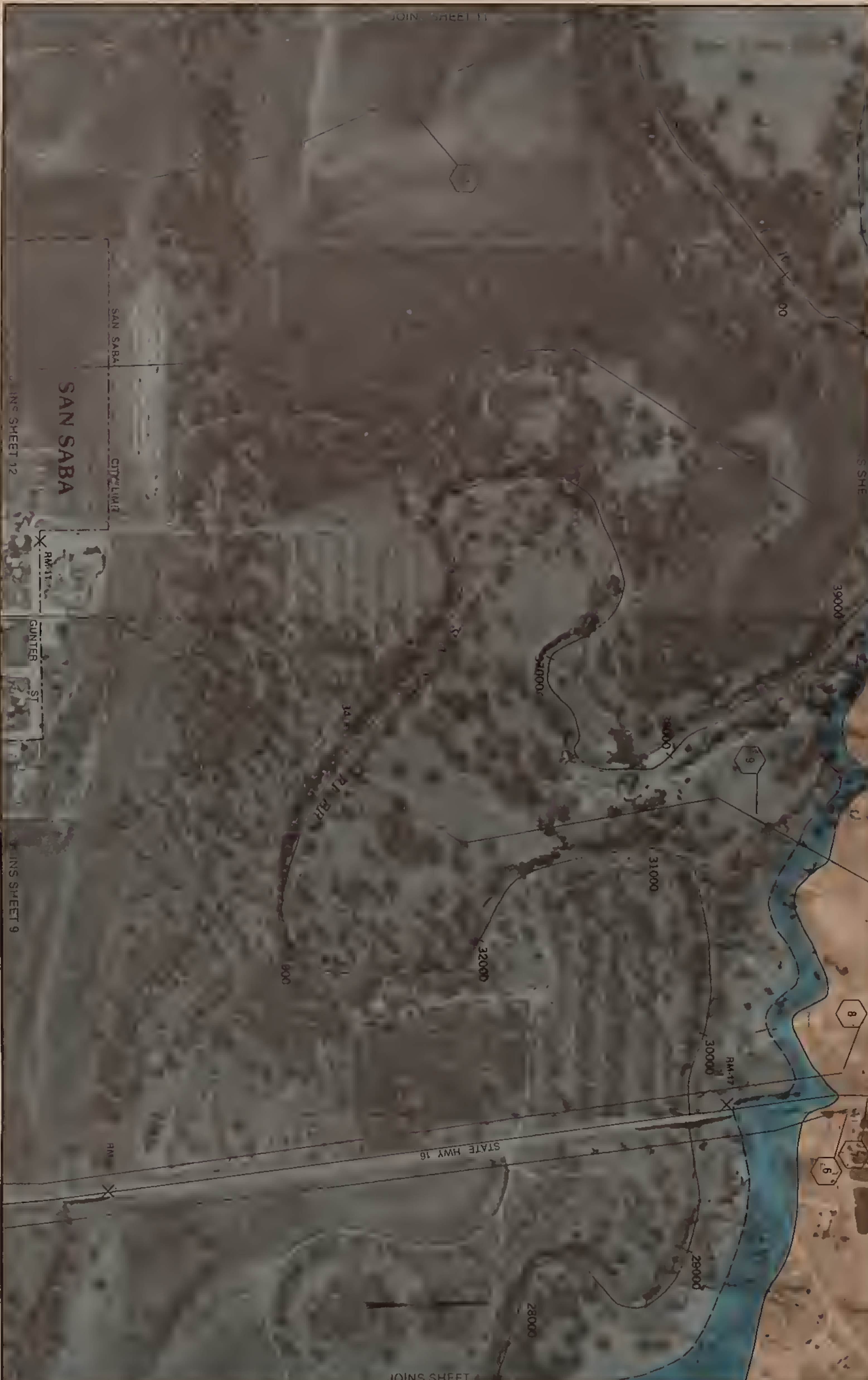

LEGEND

100 YEAR FLOOD HAZARD AREA

500 YEAR FLOOD HAZARD AREA

AREA OF SHALLOW FLOODING

CROSS SECTION LOCATION

15000 CHANNEL STATION

STREAM CHANNEL

ELEVATION REFERENCE MARKS

SCALE 0 400 800 FEET

0 100 200 METERS

APPROXIMATE

DUE TO INHERENT AERIAL PHOTOGRAPHIC DISPLACEMENT, THE PHOTOGRAPHIC IMAGE MAY VARY FROM TRUE GROUND LOCATION

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FLOOD HAZARD AREA

SAN SABA RIVER

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LEGEND

100 YEAR FLOOD HAZARD AREA

500 YEAR FLOOD HAZARD AREA

AREA OF SHALLOW FLOODING

CROSS SECTION LOCATION

15000 CHANNEL STATION

STREAM CHANNEL

ELEVATION REFERENCE MARKS

SCALE 0 400 800 FEET
0 100 200 METERS
APPROXIMATE

DUE TO INHERENT AERIAL PHOTOGRAPHIC DISPLACEMENT, THE PHOTOGRAPHIC IMAGE MAY VARY FROM TRUE GROUND LOCATION

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SAN SABA RIVER

SHEET 9 OF 15

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LEGEND

100 YEAR FLOOD HAZARD AREA

500 YEAR FLOOD HAZARD AREA

AREA OF SHALLOW FLOODING

CROSS SECTION LOCATION

15000 CHANNEL STATION

STREAM CHANNEL

ELEVATION REFERENCE MARKS

SCALE 0 400 800 FEET

0 100 200 METERS

APPROXIMATE

DUE TO INHERENT AERIAL PHOTOGRAPHIC DISPLACEMENT, THE PHOTOGRAPHIC IMAGE MAY VARY FROM TRUE GROUND LOCATION

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FLOOD HAZARD AREA

SAN SABA RIVER

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JUNE 1987 4-R-40093

LEGEND

100 YEAR FLOOD HAZARD AREA

500 YEAR FLOOD HAZARD AREA

AREA OF SHALLOW FLOODING

CROSS SECTION LOCATION

15000 CHANNEL STATION

STREAM CHANNEL

ELEVATION REFERENCE MARKS

SCALE 0 400 800 FEET

0 100 200 METERS

APPROXIMATE

DUE TO INHERENT AERIAL PHOTOGRAPHIC DISPLACEMENT, THE PHOTOGRAPHIC IMAGE MAY VARY FROM TRUE GROUND LOCATION

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FLOOD HAZARD AREA

SAN SABA RIVER

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LEGEND

100 YEAR FLOOD HAZARD AREA

500 YEAR FLOOD HAZARD AREA

AREA OF SHALLOW FLOODING

CROSS SECTION LOCATION

STREAM CHANNEL

ELEVATION REFERENCE MARKS

15000 CHANNEL STATION

SCALE 0 400 800 FEET; 0 100 200 METERS APPROXIMATE

DUE TO INHERENT AERIAL PHOTOGRAPHIC DISPLACEMENT, THE PHOTOGRAPHIC IMAGE MAY VARY FROM TRUE GROUND LOCATION

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FLOOD PLAIN MANAGEMENT STUDY
SAN SABA COUNTY, TEXAS

FLOOD HAZARD AREA

SAN SABA RIVER

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LEGEND

100 YEAR FLOOD HAZARD AREA	CROSS SECTION LOCATION
500 YEAR FLOOD HAZARD AREA	STREAM CHANNEL
AREA OF SHALLOW FLOODING	× ELEVATION REFERENCE MARKS

15000 ⟶ CHANNEL STATION

SCALE 0 400 800 FEET
0 100 200 METERS
APPROXIMATE

DUE TO INHERENT AERIAL PHOTOGRAPHIC DISPLACEMENT, THE PHOTOGRAPHIC IMAGE MAY VARY FROM TRUE GROUND LOCATION

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FLOOD HAZARD AREA

SAN SABA RIVER

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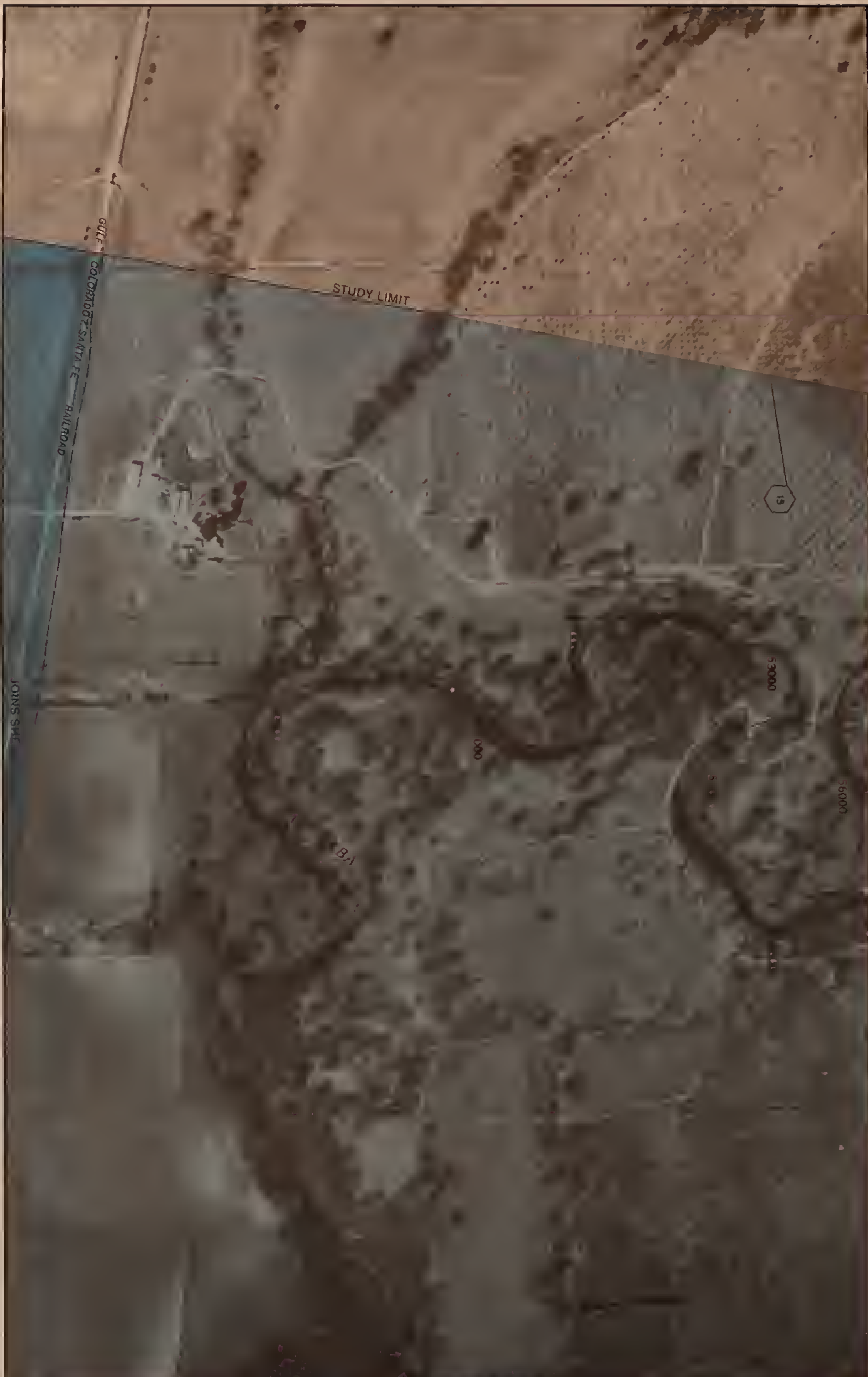

LEGEND

100 YEAR FLOOD HAZARD AREA	CROSS SECTION LOCATION 15000 ⟶ CHANNEL STATION
500 YEAR FLOOD HAZARD AREA	STREAM CHANNEL
AREA OF SHALLOW FLOODING	× ELEVATION REFERENCE MARKS

SCALE 0 400 800 FEET / 0 100 200 METERS APPROXIMATE

DUE TO INHERENT AERIAL PHOTOGRAPHIC DISPLACEMENT, THE PHOTOGRAPHIC IMAGE MAY VARY FROM TRUE GROUND LOCATION

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FLOOD HAZARD AREA

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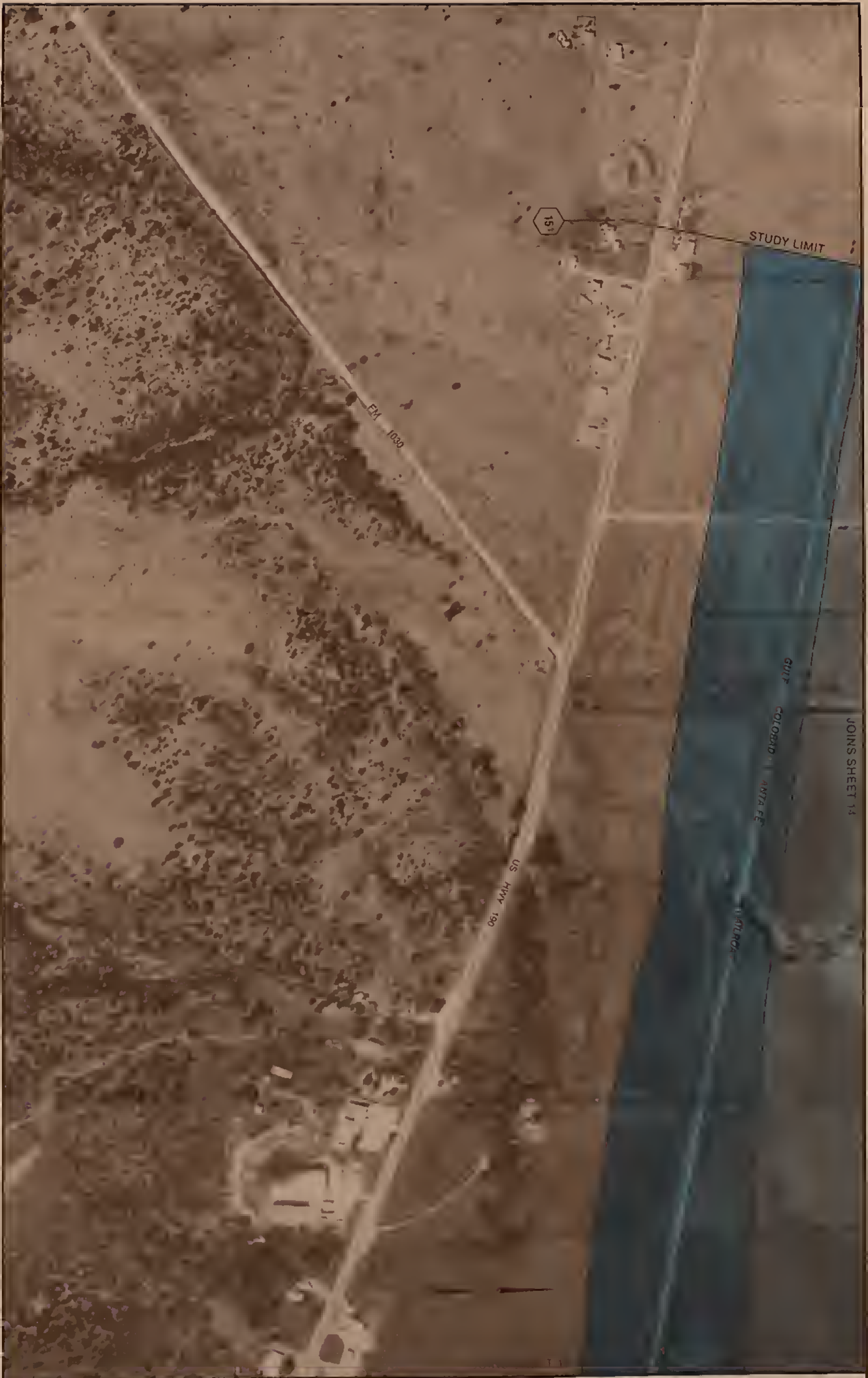

LEGEND

100 YEAR FLOOD HAZARD AREA

500 YEAR FLOOD HAZARD AREA

AREA OF SHALLOW FLOODING

CROSS SECTION LOCATION 15000 —— CHANNEL STATION

STREAM CHANNEL

× ELEVATION REFERENCE MARKS

DUE TO INHERENT AERIAL PHOTOGRAPHIC DISPLACEMENT, THE PHOTOGRAPHIC IMAGE MAY VARY FROM TRUE GROUND LOCATION

SCALE 0 400 800 FEET
0 100 200 METERS
APPROXIMATE

1983 HAP PHOTOGRAPHY

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FLOOD HAZARD AREA

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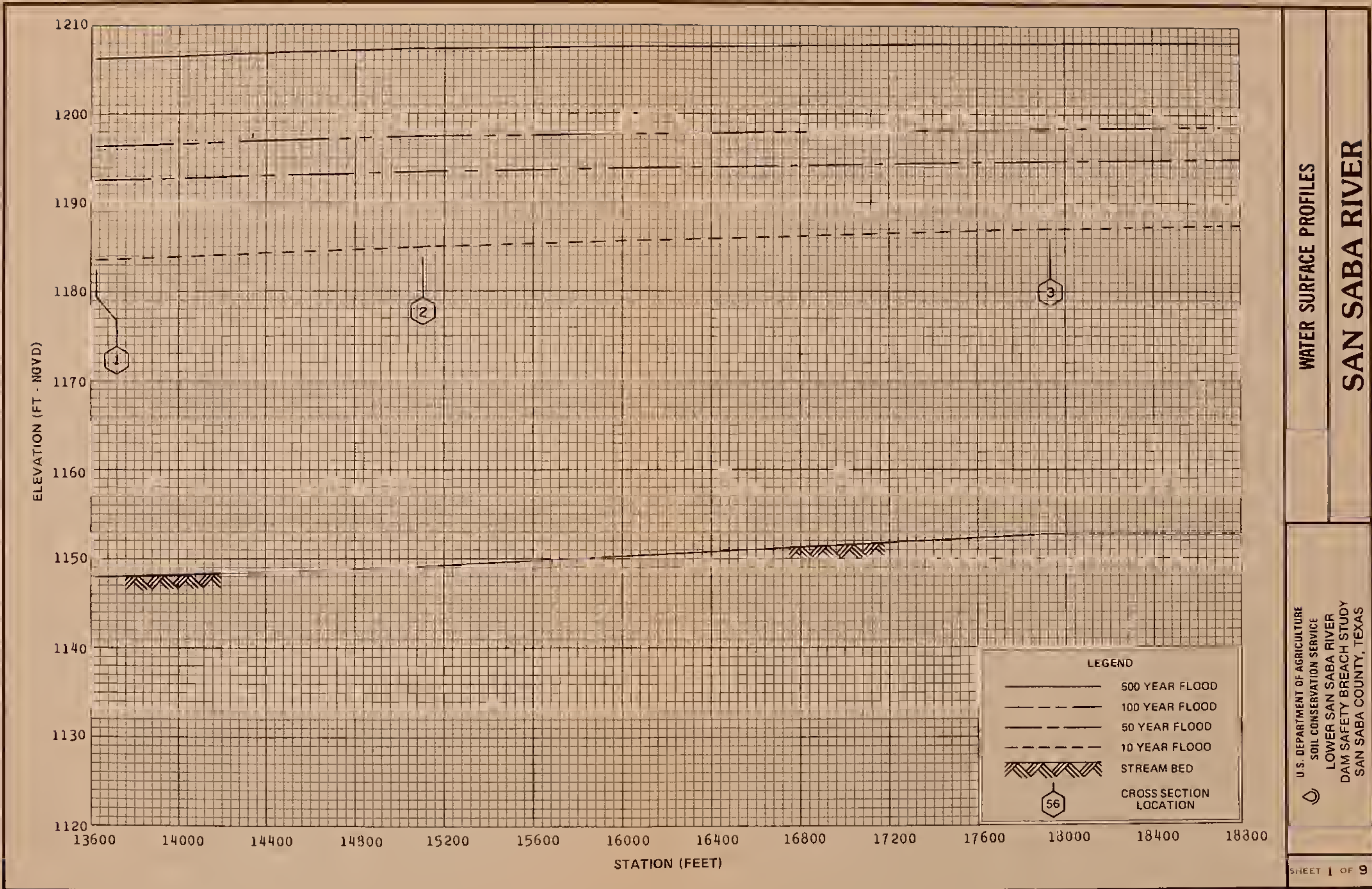
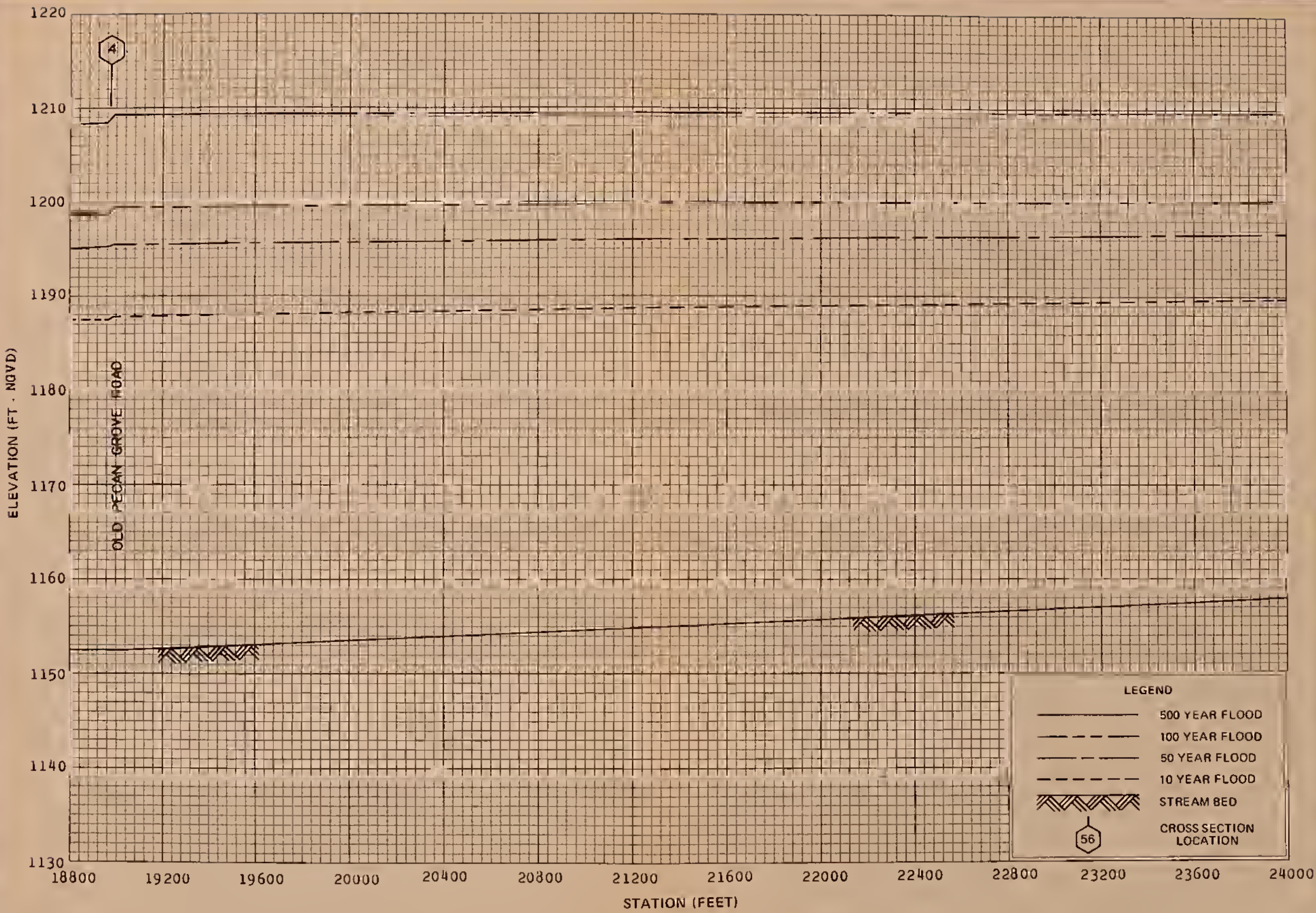


WATER SURFACE PROFILES
SAN SABA RIVER
ELEVATION (FT - NGVD)
STATION (FEET)
1210
1200
1190
1180
1170
1160
1150
1140
1130
1120
13600
14000
14400
14800
15200
15600
16000
16400
16800
17200
17600
18000
18400
18800
1
2
3
LEGEND
500 YEAR FLOOD
100 YEAR FLOOD
50 YEAR FLOOD
10 YEAR FLOOD
STREAM BED
56
CROSS SECTION LOCATION
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
LOWER SAN SABA RIVER
DAM SAFETY BREACH STUDY
SAN SABA COUNTY, TEXAS
SHEET 1 OF 9



WATER SURFACE PROFILES

SAN SABA RIVER

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
LOWER SAN SABA RIVER
DAM SAFETY BREACH STUDY
SAN SABA COUNTY, TEXAS

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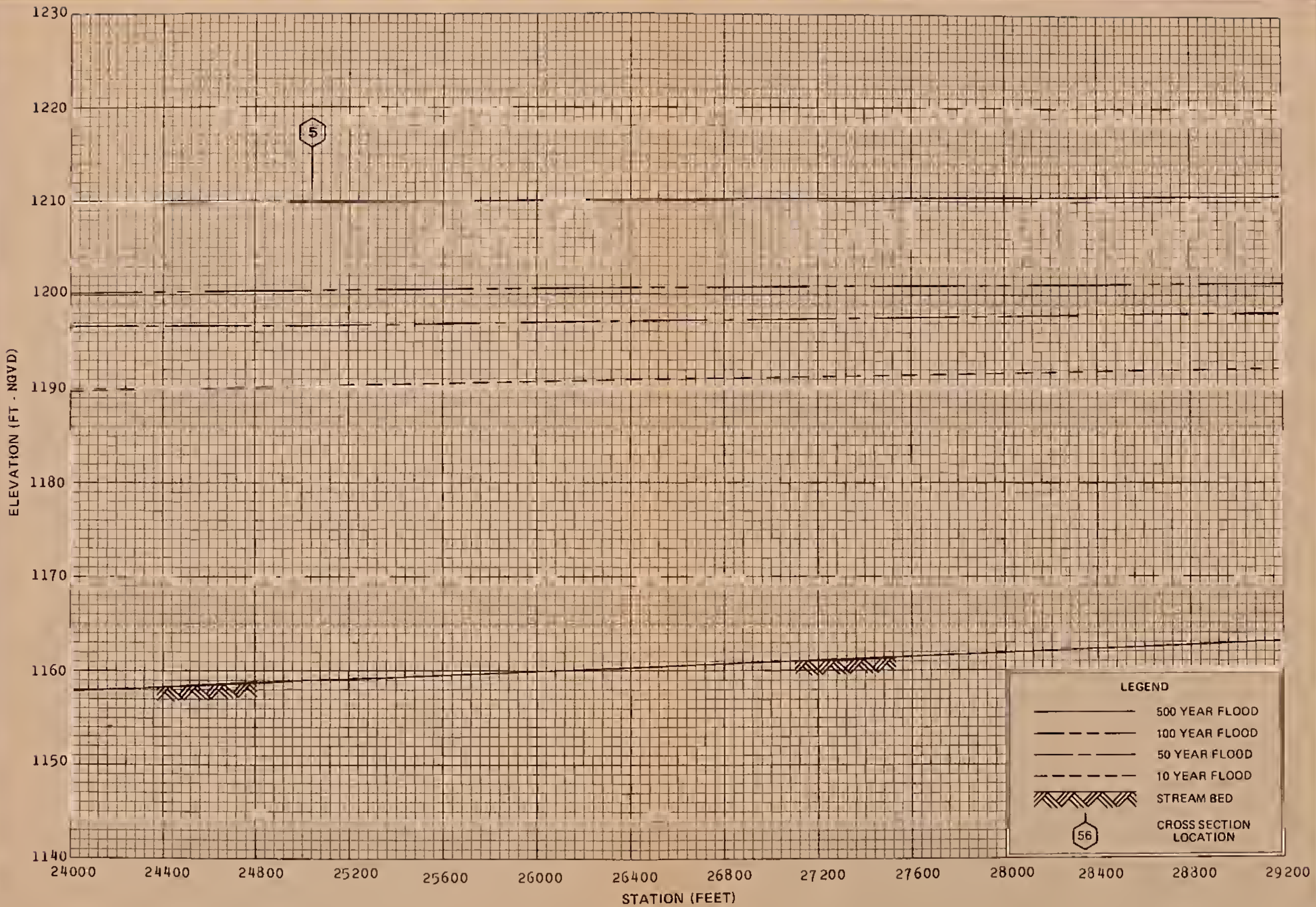
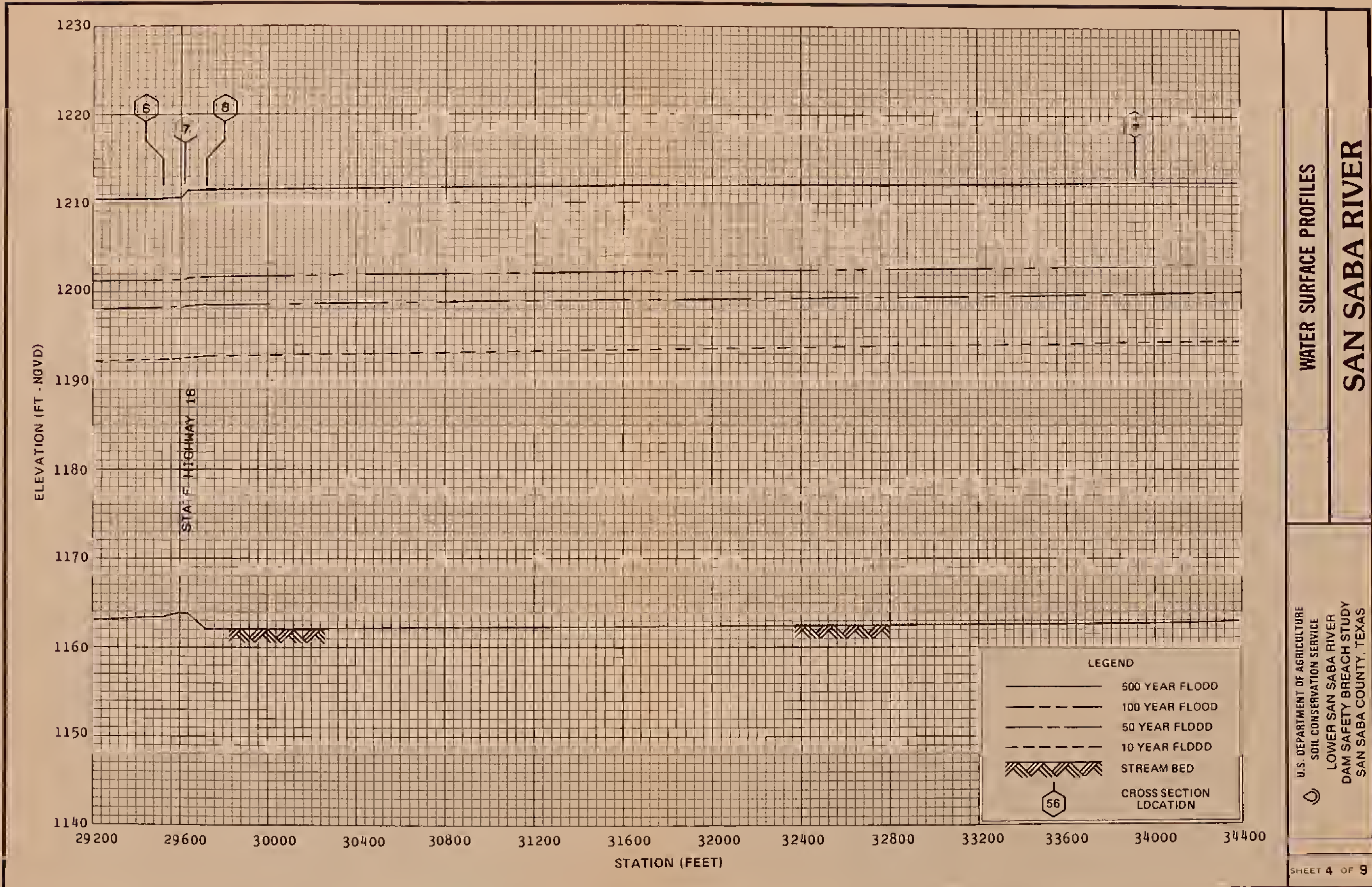


WATER SURFACE PROFILES

SAN SABA RIVER

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
LOWER SAN SABA RIVER
DAM SAFETY BREACH STUDY
SAN SABA COUNTY, TEXAS

SHEET 3 OF 9


ELEVATION (FT - NGVD)
1230
1220
1210
1200
1190
1180
1170
1160
1150
1140
29200
29600
30000
30400
30800
31200
31600
32000
32400
32800
33200
33600
34000
34400
STATION (FEET)
6
7
8
STATE HIGHWAY 16
LEGEND
500 YEAR FLOOD
100 YEAR FLOOD
50 YEAR FLOOD
10 YEAR FLOOD
STREAM BED
56
CROSS SECTION LOCATION
WATER SURFACE PROFILES
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LOWER SAN SABA RIVER
DAM SAFETY BREACH STUDY
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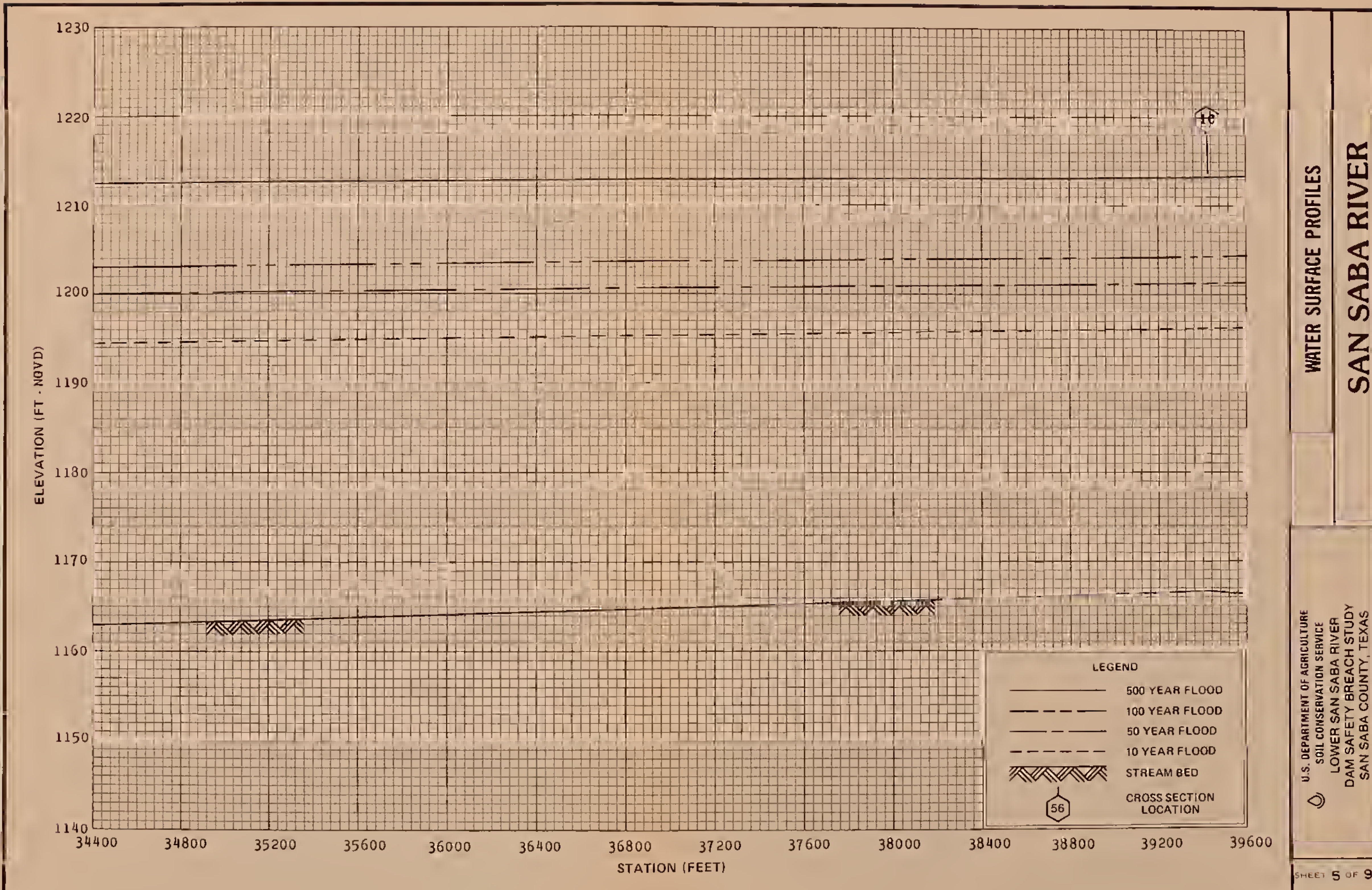
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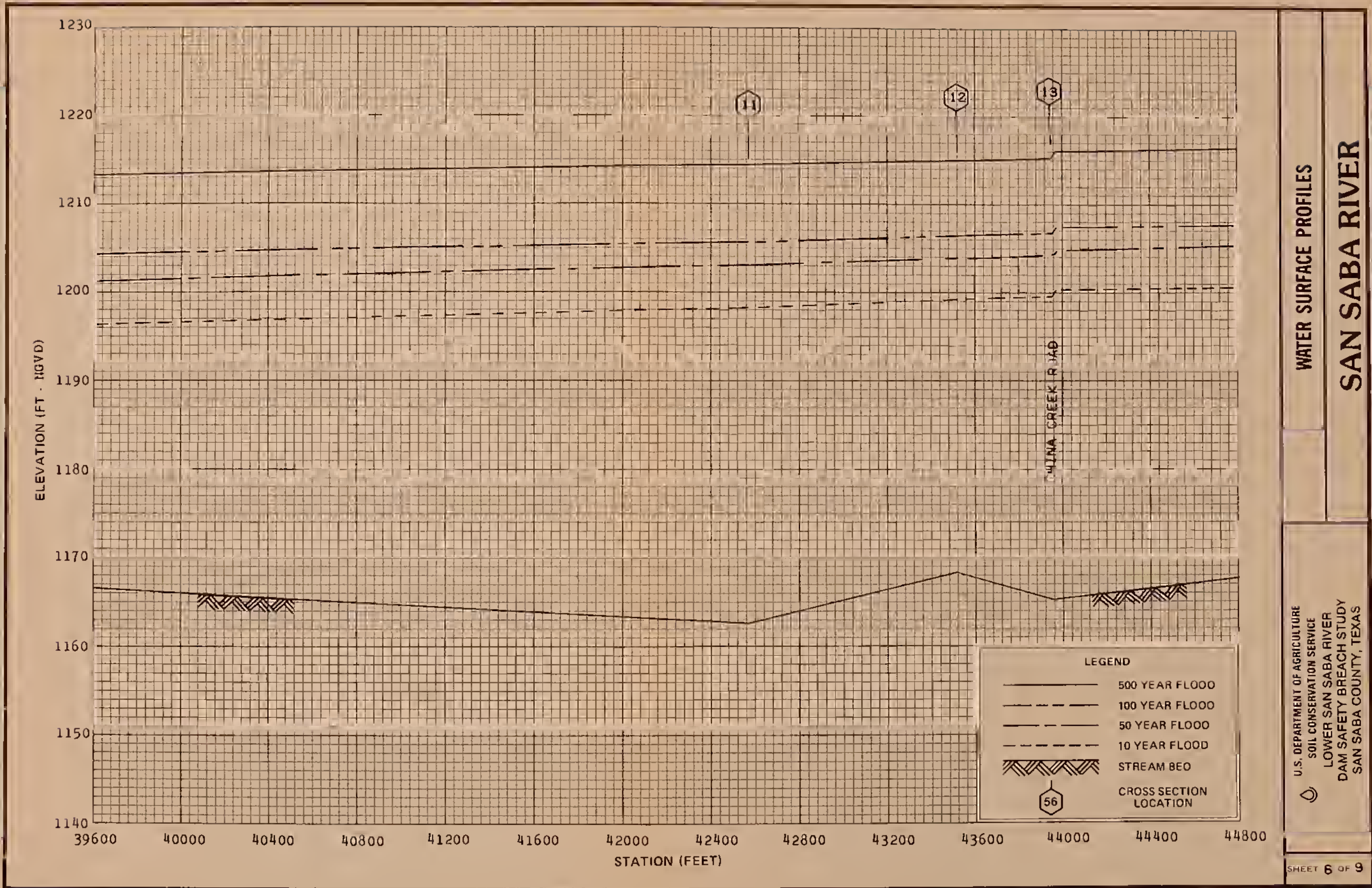
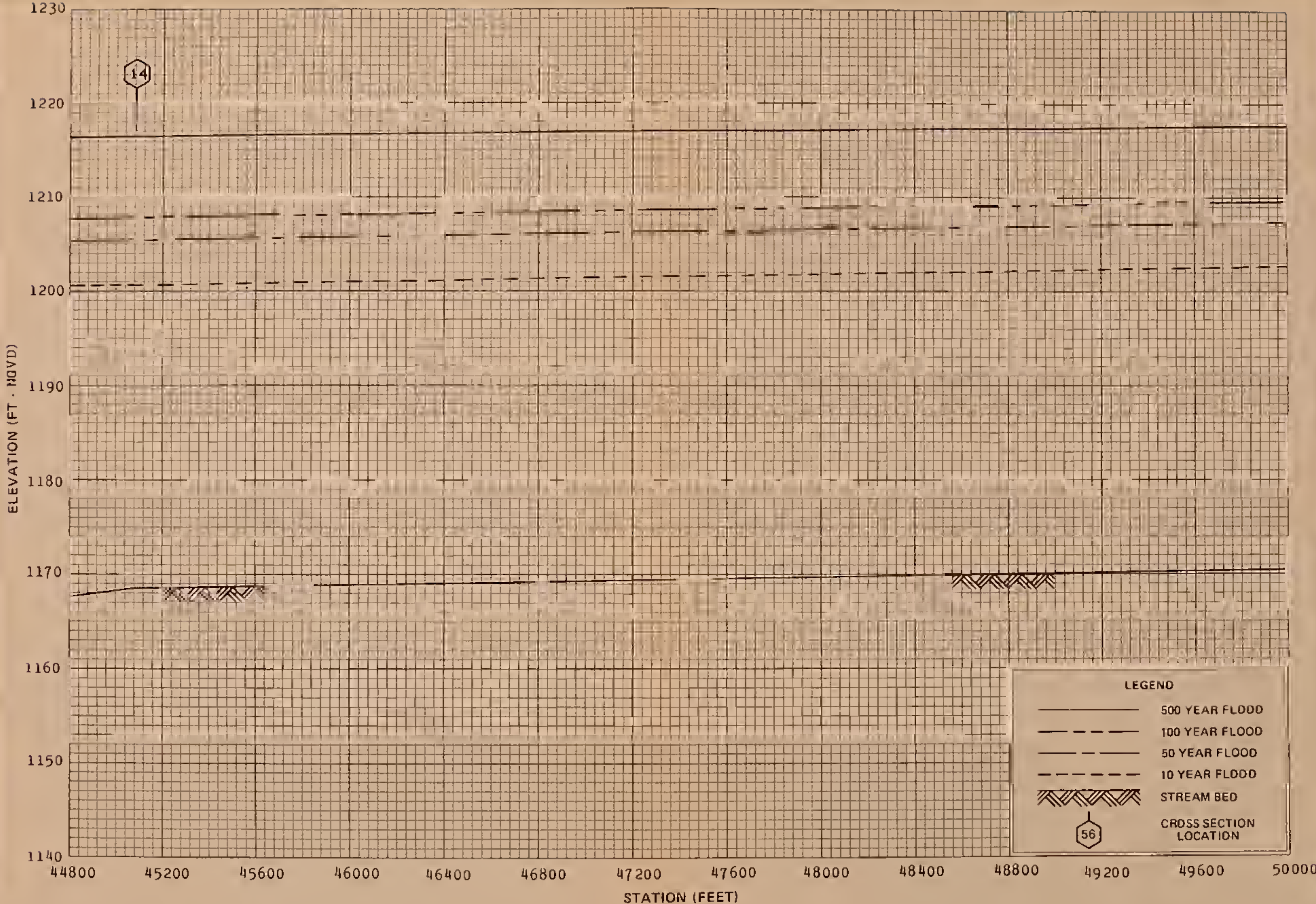
SOIL CONSERVATION SERVICE
LOWER SAN SABA RIVER
DAM SAFETY BREACH STUDY
SAN SABA COUNTY, TEXAS
SHEET 5 OF 9
ELEVATION (FT - NGVD)
1230
1220
1210
1200
1190
1180
1170
1160
1150
1140
STATION (FEET)
34400
34800
35200
35600
36000
36400
36800
37200
37600
38000
38400
38800
39200
39600
LEGEND
500 YEAR FLOOD
100 YEAR FLOOD
50 YEAR FLOOD
10 YEAR FLOOD
STREAM BED
56
CROSS SECTION LOCATION
16



ELEVATION (FT. NGVD)
1230
1220
1210
1200
1190
1180
1170
1160
1150
1140
11
12
13
CHINA CREEK ROAD
39600
40000
40400
40800
41200
41600
42000
42400
42800
43200
43600
44000
44400
44800
STATION (FEET)
LEGEND
500 YEAR FLOOD
100 YEAR FLOOD
50 YEAR FLOOD
10 YEAR FLOOD
STREAM BED
56
CROSS SECTION LOCATION
SAN SABA RIVER
WATER SURFACE PROFILES
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
LOWER SAN SABA RIVER
DAM SAFETY BREACH STUDY
SAN SABA COUNTY, TEXAS
SHEET 6 OF 9

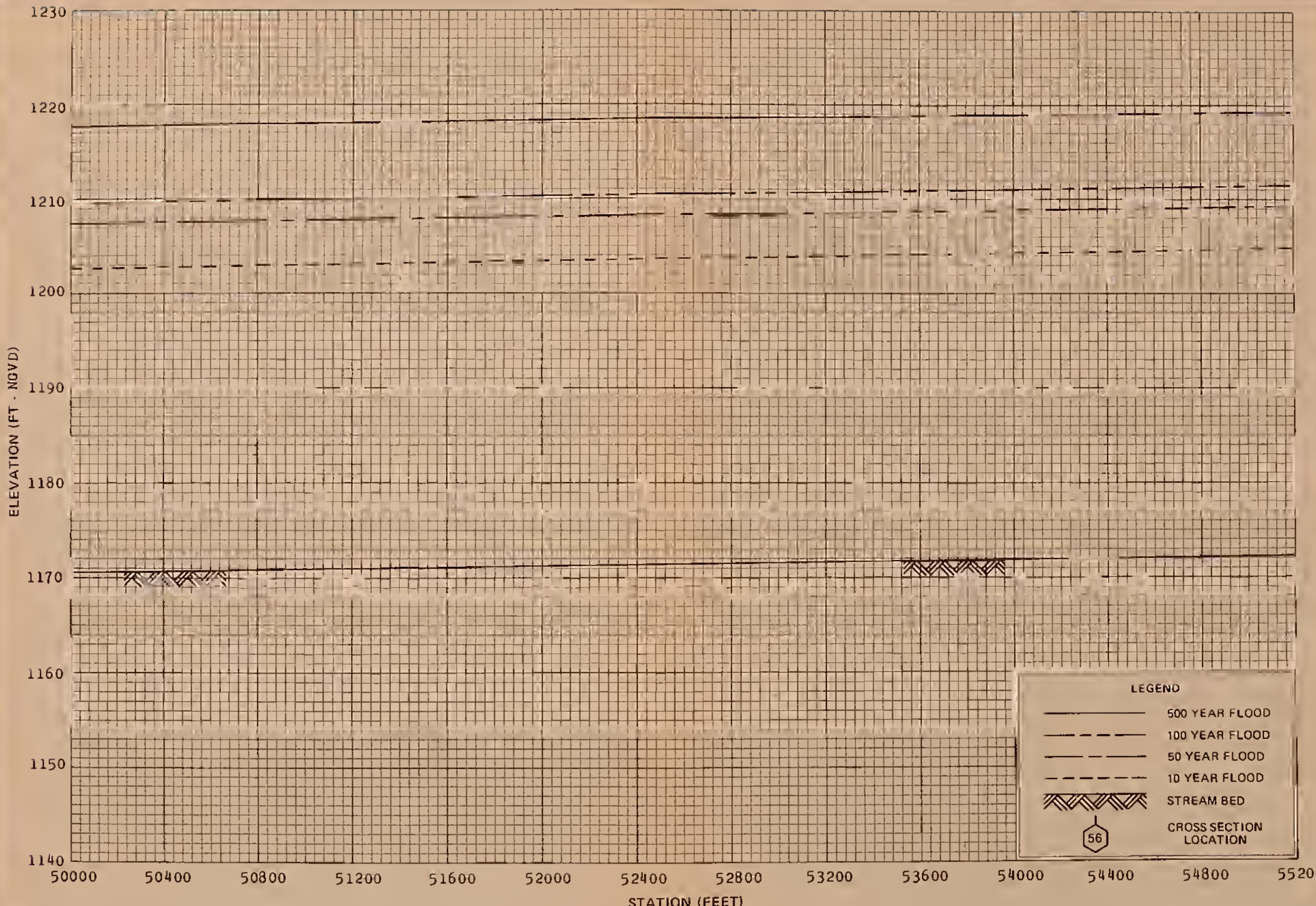


WATER SURFACE PROFILES

SAN SABA RIVER

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
LOWER SAN SABA RIVER
DAM SAFETY BREACH STUDY
SAN SABA COUNTY, TEXAS

SHEET 7 OF 9

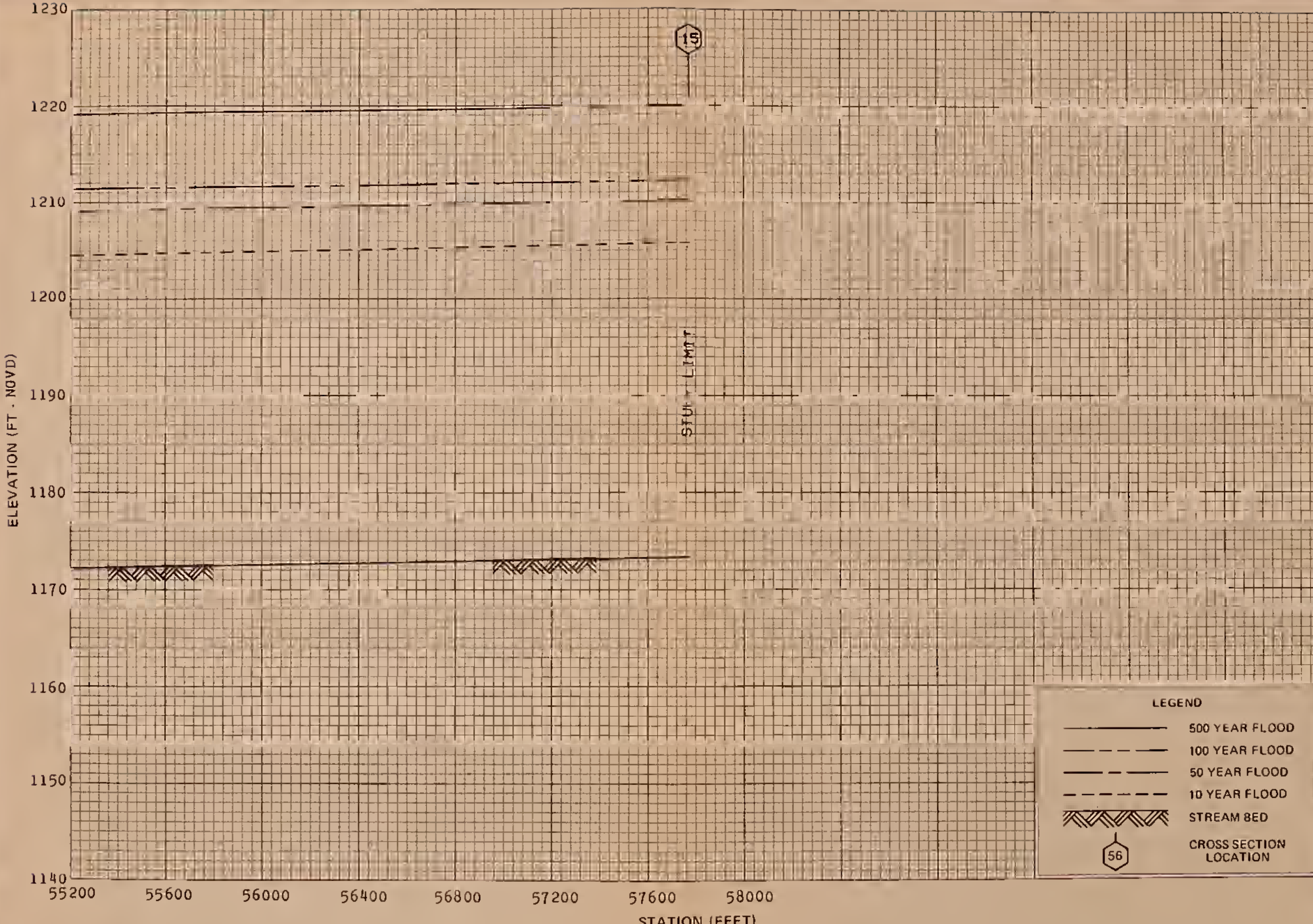


WATER SURFACE PROFILES

SAN SABA RIVER

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
LOWER SAN SABA RIVER
DAM SAFETY BREACH STUDY
SAN SABA COUNTY, TEXAS

SHEET 8 OF 9

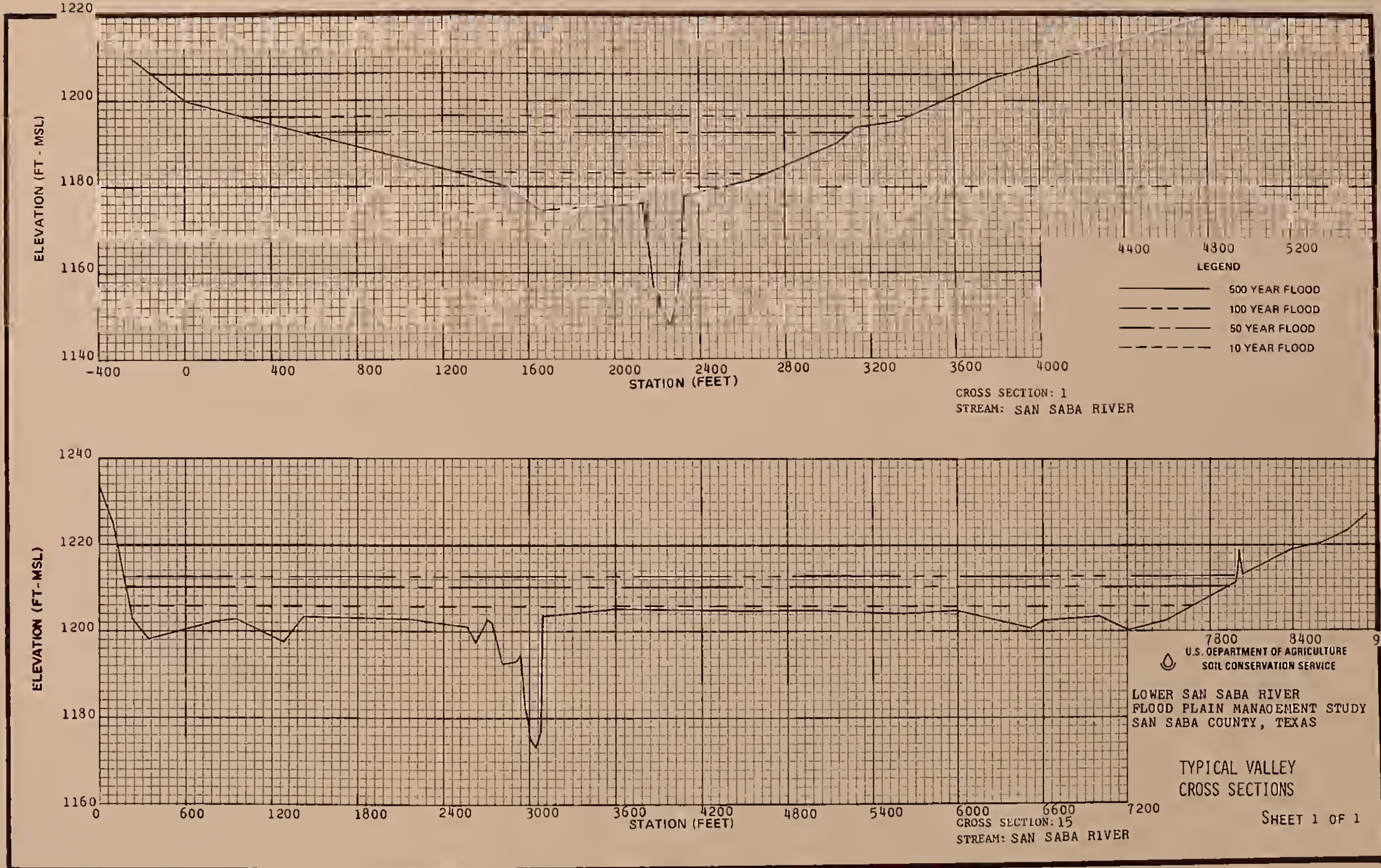


SAN SABA RIVER

WATER SURFACE PROFILES

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
LOWER SAN SABA RIVER
DAM SAFETY BREACH STUDY
SAN SABA COUNTY, TEXAS

SHEET 9 OF 9



ELEVATION (FT - MSL)
1220
1200
1180
1160
1140
-400
0
400
800
1200
1600
2000
2400
2800
3200
3600
4000
4400
4800
5200
STATION (FEET)
LEGEND
500 YEAR FLOOD
100 YEAR FLOOD
50 YEAR FLOOD
10 YEAR FLOOD
CROSS SECTION: 1
STREAM: SAN SABA RIVER
ELEVATION (FT-MSL)
1240
1220
1200
1180
1160
0
600
1200
1800
2400
3000
3600
4200
4800
5400
6000
6600
7200
7800
8400
9000
STATION (FEET)
CROSS SECTION: 15
STREAM: SAN SABA RIVER
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
LOWER SAN SABA RIVER
FLOOD PLAIN MANAGEMENT STUDY
SAN SABA COUNTY, TEXAS
TYPICAL VALLEY
CROSS SECTIONS
SHEET 1 OF 1

January 27, 1989

Dr. Richard A. Farley, Director
National Agricultural Library
U. S. Dept. of Agriculture
Beltsville, MD 20705

Dear Dr. Farley:

Enclosed for your information and use is a copy of the recently completed Flood Plain Management Study report, "Lower San Saba River, San Saba County, Texas." This study was made at the request of the San Saba-Brady Soil and Water Conservation District, the City of San Saba, the San Saba County Commissioners Court, and the Texas Water Commission, in accordance with the Department's November 1973 Joint Coordination Agreement (Revised 10/31/78) with the Soil Conservation Service.

This study was carried out under the authority of Section 6 of Public Law 83-566, in accordance with Executive Order 11988, and House Document No. 465, 89th Congress, 2nd Session, especially recommendation 9(c), "Regulation of Land Use." The purpose of the study is to make flood hazard and land use information available to the local government and citizens to encourage land use appropriate to the degree of hazard involved.

The Soil Conservation Service's objective in developing these technical data is to help reduce present and potential flood damages through wise use of flood plain lands, thereby improving the health, safety, economy, and environmental conditions of the community.

Sincerely,

Harry W Oneth

HARRY W. ONETH
State Conservationist

Enclosure

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

LEGEND

BRADY RESERVOIR BREACH INUNDATION AREA

CROSS SECTION LOCATION

15000 CHANNEL STATION

STREAM CHANNEL

ELEVATION REFERENCE MARKS

SCALE 0 400 800 FEET
0 100 200 METERS
APPROXIMATE

DUE TO INHERENT AERIAL PHOTOGRAPHIC DISPLACEMENT, THE PHOTOGRAPHIC IMAGE MAY VARY FROM TRUE GROUND LOCATION

1983 HAP PHOTOGRAPHY

U S DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
SAN SABA RIVER
FLOOD PLAIN MANAGEMENT STUDY
SAN SABA COUNTY, TEXAS

BRADY RESERVOIR BREACH INUNDATION AREA

SAN SABA RIVER

SHEET 1 OF 15

JUNE 1987 4-R-40093

LEGEND

BRADY RESERVOIR BREACH INUNDATION AREA

CROSS SECTION LOCATION

15000 — CHANNEL STATION

STREAM CHANNEL

× ELEVATION REFERENCE MARKS

SCALE 0 400 800 FEET; 0 100 200 METERS APPROXIMATE

DUE TO INHERENT AERIAL PHOTOGRAPHIC DISPLACEMENT, THE PHOTOGRAPHIC IMAGE MAY VARY FROM TRUE GROUND LOCATION

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SAN SABA RIVER
FLOOD PLAIN MANAGEMENT STUDY
SAN SABA COUNTY, TEXAS

BRADY RESERVOIR BREACH INUNDATION AREA

SAN SABA RIVER

SHEET 2 OF 15

JUNE 1987 4-P-40093

LEGEND

BRADY RESERVOIR BREACH INUNDATION AREA

CROSS SECTION LOCATION

15000 —— CHANNEL STATION

STREAM CHANNEL

× ELEVATION REFERENCE MARKS

SCALE 0 400 800 FEET
0 100 200 METERS
APPROXIMATE

DUE TO INHERENT AERIAL PHOTOGRAPHIC DISPLACEMENT, THE PHOTOGRAPHIC IMAGE MAY VARY FROM TRUE GROUND LOCATION

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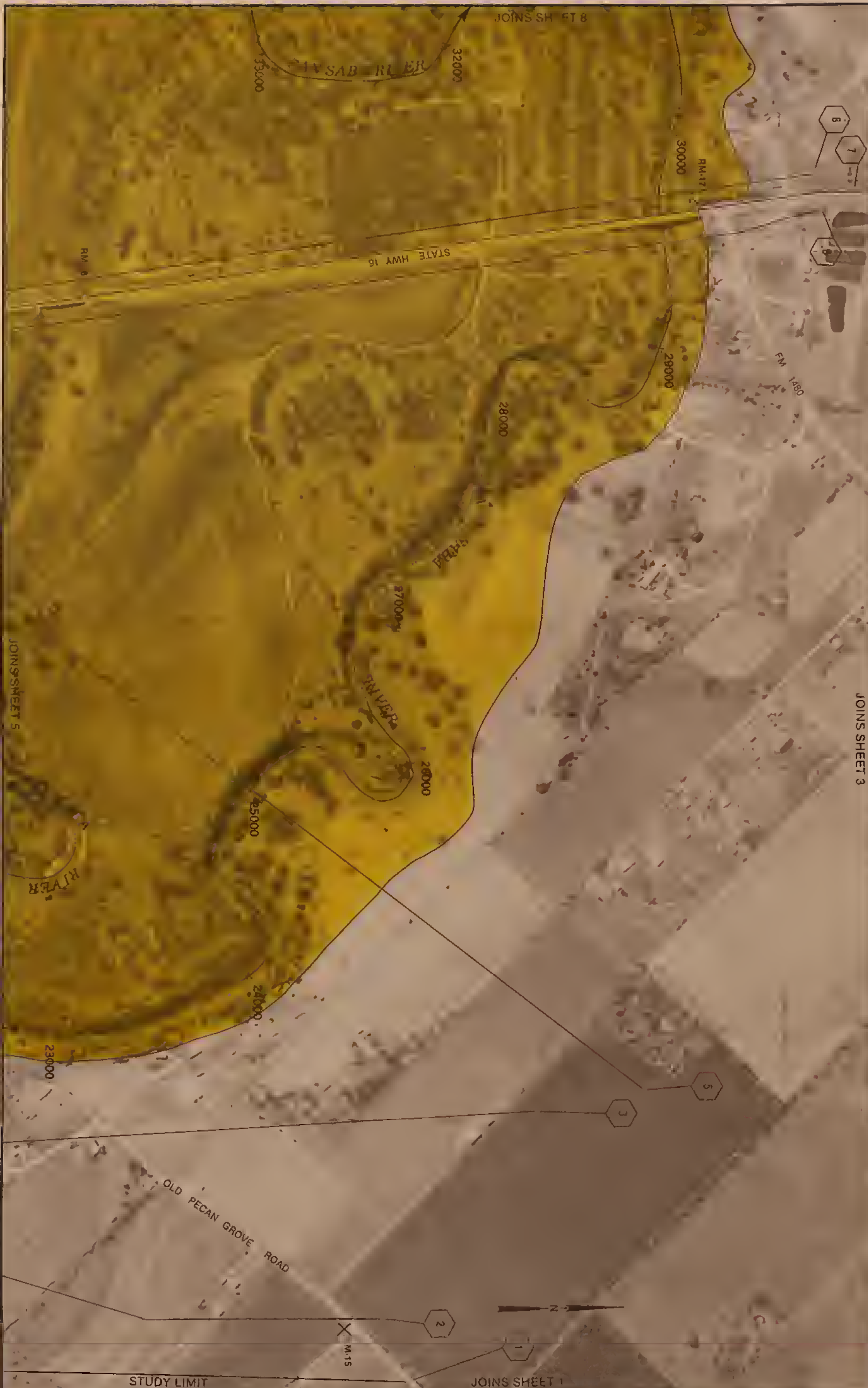
FLOOD PLAIN MANAGEMENT STUDY
SAN SABA COUNTY, TEXAS

BRADY RESERVOIR BREACH INUNDATION AREA

SAN SABA RIVER

SHEET 3 OF 15

JUNE 1987 4-R-40093



LEGEND

BRADY RESERVOIR BREACH INUNDATION AREA

CROSS SECTION LOCATION

15000 → CHANNEL STATION

STREAM CHANNEL

× ELEVATION REFERENCE MARKS

SCALE 0 400 800 FEET; 0 100 200 METERS APPROXIMATE

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SAN SABA RIVER
FLOOD PLAIN MANAGEMENT STUDY
SAN SABA COUNTY, TEXAS

BRADY RESERVOIR BREACH INUNDATION AREA

SAN SABA RIVER

SHEET 2 OF 15

JUNE 1987 4-R-40093

LEGEND

BRADY RESERVOIR BREACH INUNDATION AREA

CROSS SECTION LOCATION 15000 —— CHANNEL STATION

STREAM CHANNEL

× ELEVATION REFERENCE MARKS

SCALE 0 400 800 FEET
0 100 200 METERS
APPROXIMATE

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SOIL CONSERVATION SERVICE

SAN SABA RIVER
FLOOD PLAIN MANAGEMENT STUDY
SAN SABA COUNTY, TEXAS

BRADY RESERVOIR BREACH INUNDATION AREA

SAN SABA RIVER

SHEET 5 OF 15

JUNE 1987 4-R-40093

LEGEND

BRADY RESERVOIR BREACH INUNDATION AREA	CROSS SECTION LOCATION
	15000 — CHANNEL STATION
	STREAM CHANNEL
	× ELEVATION REFERENCE MARKS

SCALE 0 400 800 FEET
0 100 200 METERS
APPROXIMATE

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FLOOD PLAIN MANAGEMENT STUDY
SAN SABA COUNTY, TEXAS

BRADY RESERVOIR BREACH INUNDATION AREA

SAN SABA RIVER

SHEET 6 OF 15

JUNE 1987 4-R 40093

LEGEND

BRADY RESERVOIR BREACH INUNDATION AREA

CROSS SECTION LOCATION

15000 CHANNEL STATION

STREAM CHANNEL

× ELEVATION REFERENCE MARKS

SCALE 0 400 800 FEET
0 100 200 METERS
APPROXIMATE

DUE TO INHERENT AERIAL PHOTOGRAPHIC DISPLACEMENT, THE PHOTOGRAPHIC IMAGE MAY VARY FROM TRUE GROUND LOCATION. 1983 HAP PHOTOGRAPHY

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SAN SABA RIVER
FLOOD PLAIN MANAGEMENT STUDY
SAN SABA COUNTY, TEXAS

BRADY RESERVOIR BREACH INUNDATION AREA

SAN SABA RIVER

SHEET 7 OF 15

JUNE 1987 4-R-40093

LEGEND

BRADY RESERVOIR BREACH INUNDATION AREA

CROSS SECTION LOCATION 15000 —— CHANNEL STATION

STREAM CHANNEL

× ELEVATION REFERENCE MARKS

SCALE 0 400 800 FEET
0 100 200 METERS
APPROXIMATE

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SAN SABA RIVER
FLOOD PLAIN MANAGEMENT STUDY
SAN SABA COUNTY, TEXAS

BRADY RESERVOIR BREACH INUNDATION AREA

SAN SABA RIVER

SHEET 8 OF 15

JUNE 1987 4-R-40093

LEGEND

CROSS SECTION LOCATION 15000 CHANNEL STATION

STREAM CHANNEL

ELEVATION REFERENCE MARKS

BRADY RESERVOIR BREACH INUNDATION AREA

SCALE 0 400 800 FEET
0 100 200 METERS
APPROXIMATE

DUE TO INHERENT AERIAL PHOTOGRAPHIC DISPLACEMENT, THE PHOTOGRAPHIC IMAGE MAY VARY FROM TRUE GROUND LOCATION

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SOIL CONSERVATION SERVICE
SAN SABA RIVER
FLOOD PLAIN MANAGEMENT STUDY
SAN SABA COUNTY, TEXAS

BRADY RESERVOIR BREACH INUNDATION AREA

SAN SABA RIVER

SHEET 9 OF 15

JUNE 1987 4-P-40093

LEGEND

BRADY RESERVOIR BREACH INUNDATION AREA

CROSS SECTION LOCATION 15000 CHANNEL STATION

STREAM CHANNEL

ELEVATION REFERENCE MARKS

SCALE 0 400 800 FEET
0 100 200 METERS
APPROXIMATE

DUE TO INHERENT AERIAL PHOTOGRAPHIC DISPLACEMENT, THE PHOTOGRAPHIC IMAGE MAY VARY FROM TRUE GROUND LOCATION

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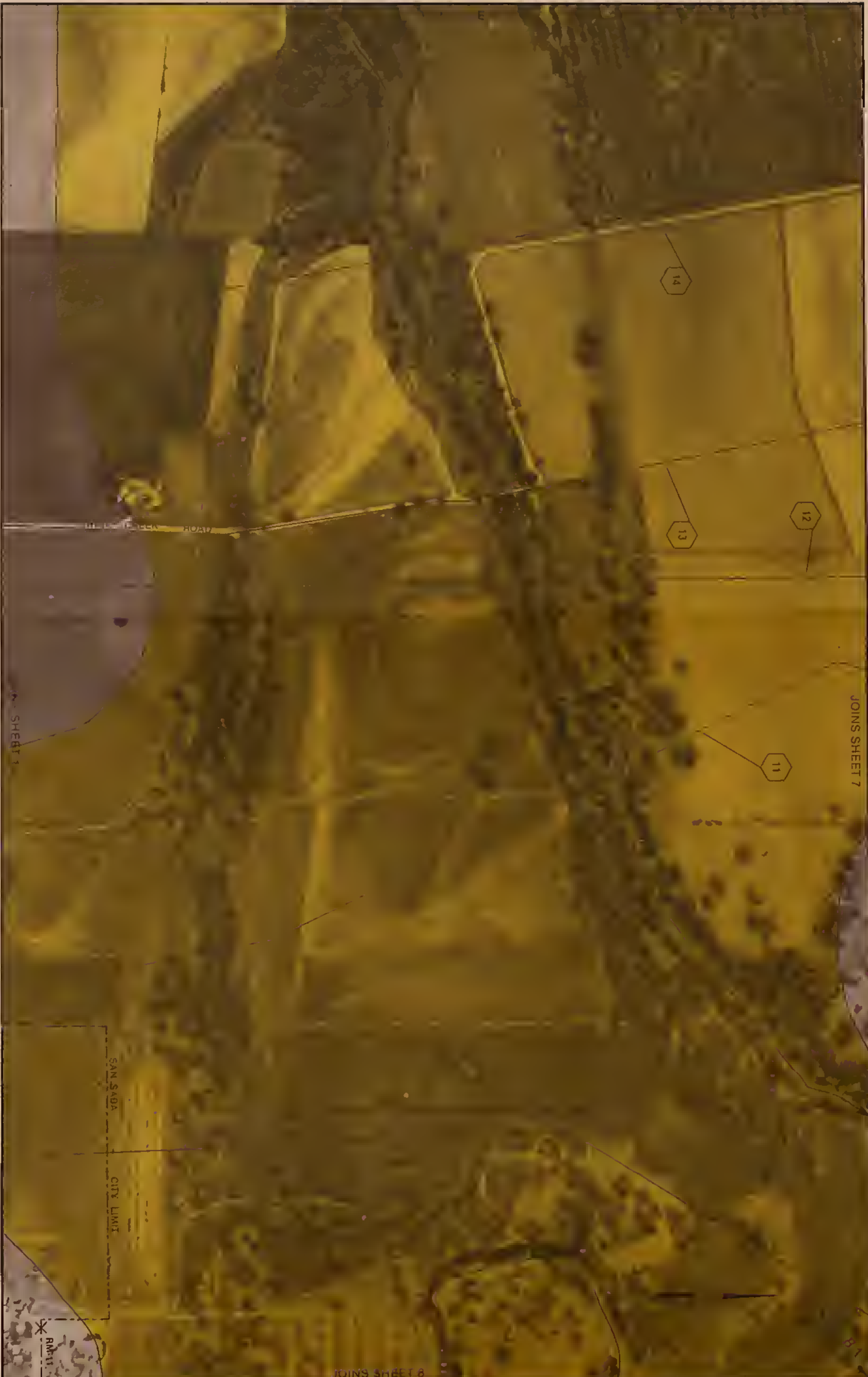
SOIL CONSERVATION SERVICE
SAN SABA RIVER
FLODD PLAIN MANAGEMENT STUDY
SAN SABA COUNTY, TEXAS

BRADY RESERVOIR BREACH INUNDATION AREA

SAN SABA RIVER

SHEET 10 OF 15

JUNE 1987 4-R-40093



LEGEND

BRADY RESERVOIR BREACH INUNDATION AREA

CROSS SECTION LOCATION

15000 ⟶ CHANNEL STATION

STREAM CHANNEL

× ELEVATION REFERENCE MARKS

SCALE 0 400 800 FEET
0 100 200 METERS
APPROXIMATE

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SOIL CONSERVATION SERVICE
SAN SABA RIVER
FLOOD PLAIN MANAGEMENT STUDY
SAN SABA COUNTY, TEXAS

BRADY RESERVOIR BREACH INUNDATION AREA

SAN SABA RIVER

SHEET 11 OF 15

JUNE 1987 4-R-40093

LEGEND

BRADY RESERVOIR BREACH INUNDATION AREA

CROSS SECTION LOCATION

15000 —— CHANNEL STATION

STREAM CHANNEL

× ELEVATION REFERENCE MARKS

SCALE 0 400 800 FEET

0 100 200 METERS

APPROXIMATE

DUE TO INHERENT AERIAL PHOTOGRAPHIC DISPLACEMENT, THE PHOTOGRAPHIC IMAGE MAY VARY FROM TRUE GROUND LOCATION

1983 HAP PHOTOGRAPHY

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SAN SABA RIVER
FLOOD PLAIN MANAGEMENT STUDY
SAN SABA COUNTY, TEXAS

BRADY RESERVOIR BREACH INUNDATION AREA

SAN SABA RIVER

SHEET 12 OF 15

JUNE 1987 4-R-40093

LEGEND

BRADY RESERVOIR BREACH INUNDATION AREA

CROSS SECTION LOCATION 15000 ——→ CHANNEL STATION

STREAM CHANNEL

× ELEVATION REFERENCE MARKS

SCALE 0 400 800 FEET
0 100 200 METERS
APPROXIMATE

DUE TO INHERENT AERIAL PHOTOGRAPHIC DISPLACEMENT, THE PHOTOGRAPHIC IMAGE MAY VARY FROM TRUE GROUND LOCATION

1983 HAP PHOTOGRAPHY

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

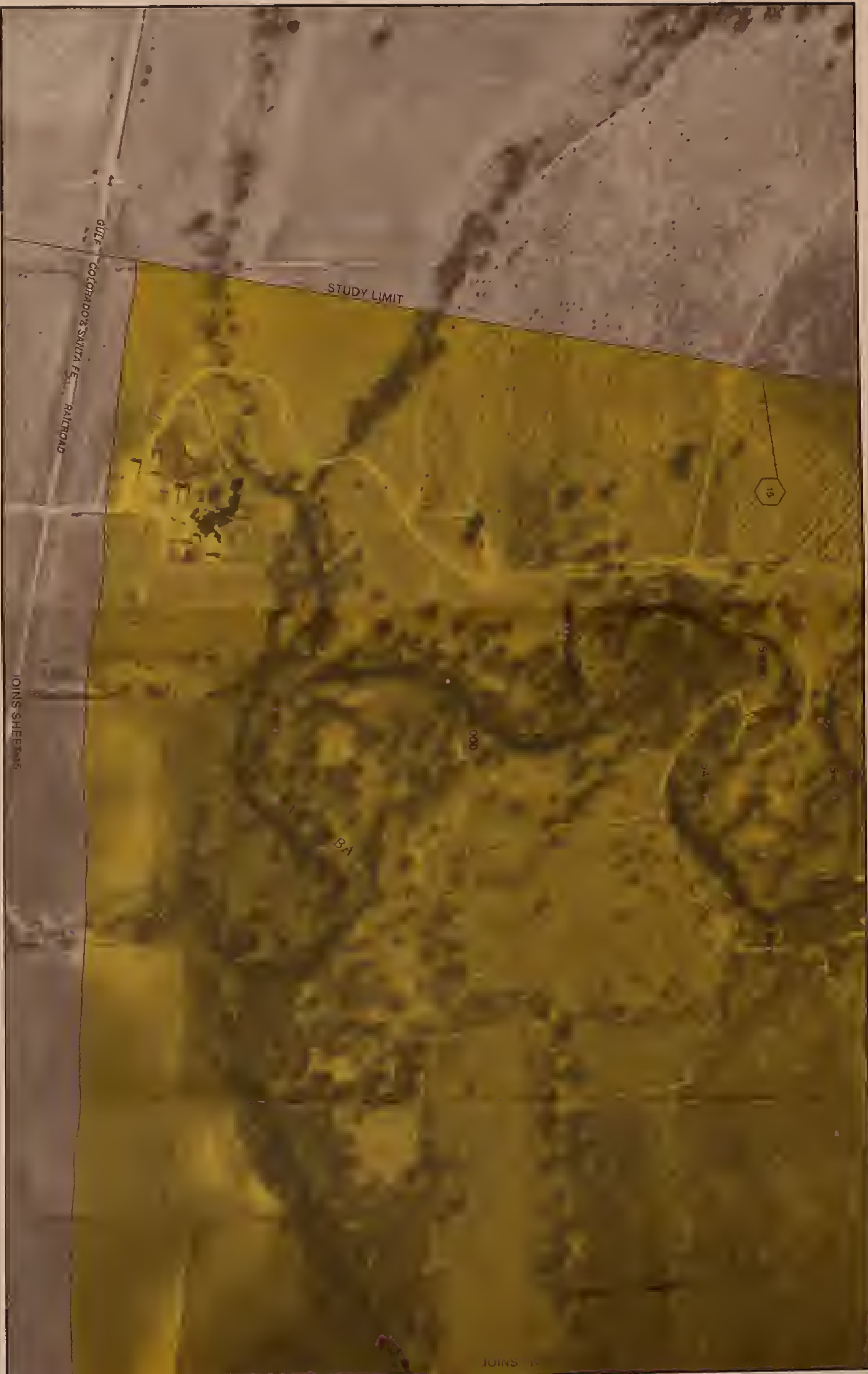
SAN SABA RIVER
FLOOD PLAIN MANAGEMENT STUDY
SAN SABA COUNTY, TEXAS

BRADY RESERVOIR BREACH INUNDATION AREA

SAN SABA RIVER

JUNE 1987 4-R-40093

SHEET 13 OF 15



LEGEND

BRADY RESERVOIR BREACH INUNDATION AREA

CROSS SECTION LOCATION

15000 → CHANNEL STATION

STREAM CHANNEL

× ELEVATION REFERENCE MARKS

SCALE 0 400 800 FEET
0 100 200 METERS
APPROXIMATE

DUE TO INHERENT AERIAL PHOTOGRAPHIC DISPLACEMENT, THE PHOTOGRAPHIC IMAGE MAY VARY FROM TRUE GROUND LOCATION

1983 HAP PHOTOGRAPHY

SHEET 14 OF 15

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SAN SABA RIVER
FLODD PLAIN MANAGEMENT STUDY
SAN SABA COUNTY, TEXAS

BRADY RESERVOIR BREACH INUNDATION AREA

SAN SABA RIVER

JUNE 1987 4-R-40093

LEGEND

BRADY RESERVOIR BREACH INUNDATION AREA

CROSS SECTION LOCATION

15000 CHANNEL STATION

STREAM CHANNEL

× ELEVATION REFERENCE MARKS

SCALE 0 400 800 FEET

0 100 200 METERS

APPROXIMATE

DUE TO INHERENT AERIAL PHOTOGRAPHIC DISPLACEMENT, THE PHOTOGRAPHIC IMAGE MAY VARY FROM TRUE GROUND LOCATION

1983 NAP PHOTOGRAPHY

SHEET 15 OF 15

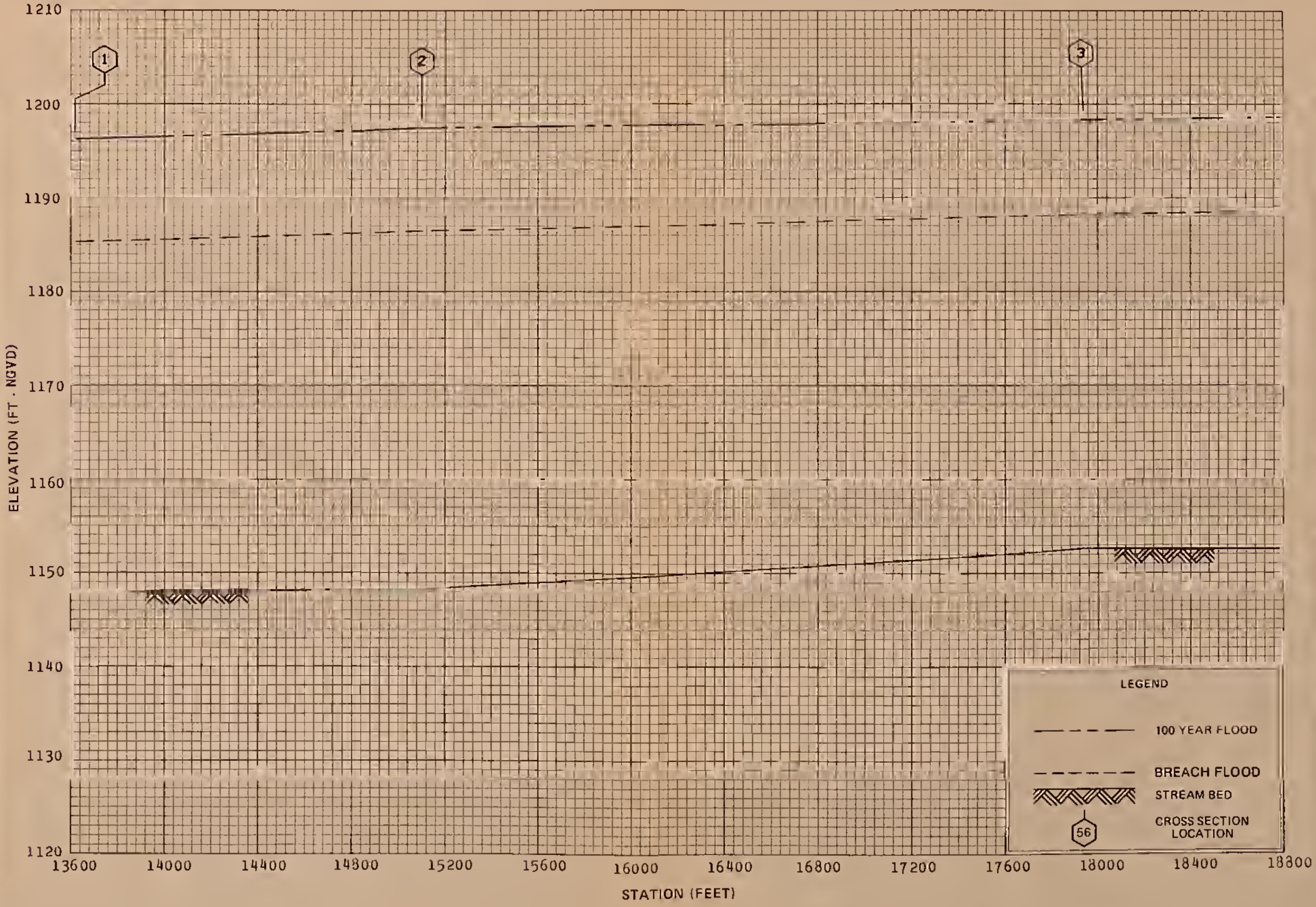
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SAN SABA RIVER
FLOOD PLAIN MANAGEMENT STUDY
SAN SABA COUNTY, TEXAS

BRADY RESERVOIR BREACH INUNDATION AREA

SAN SABA RIVER

JUNE 1987 4-P-40093

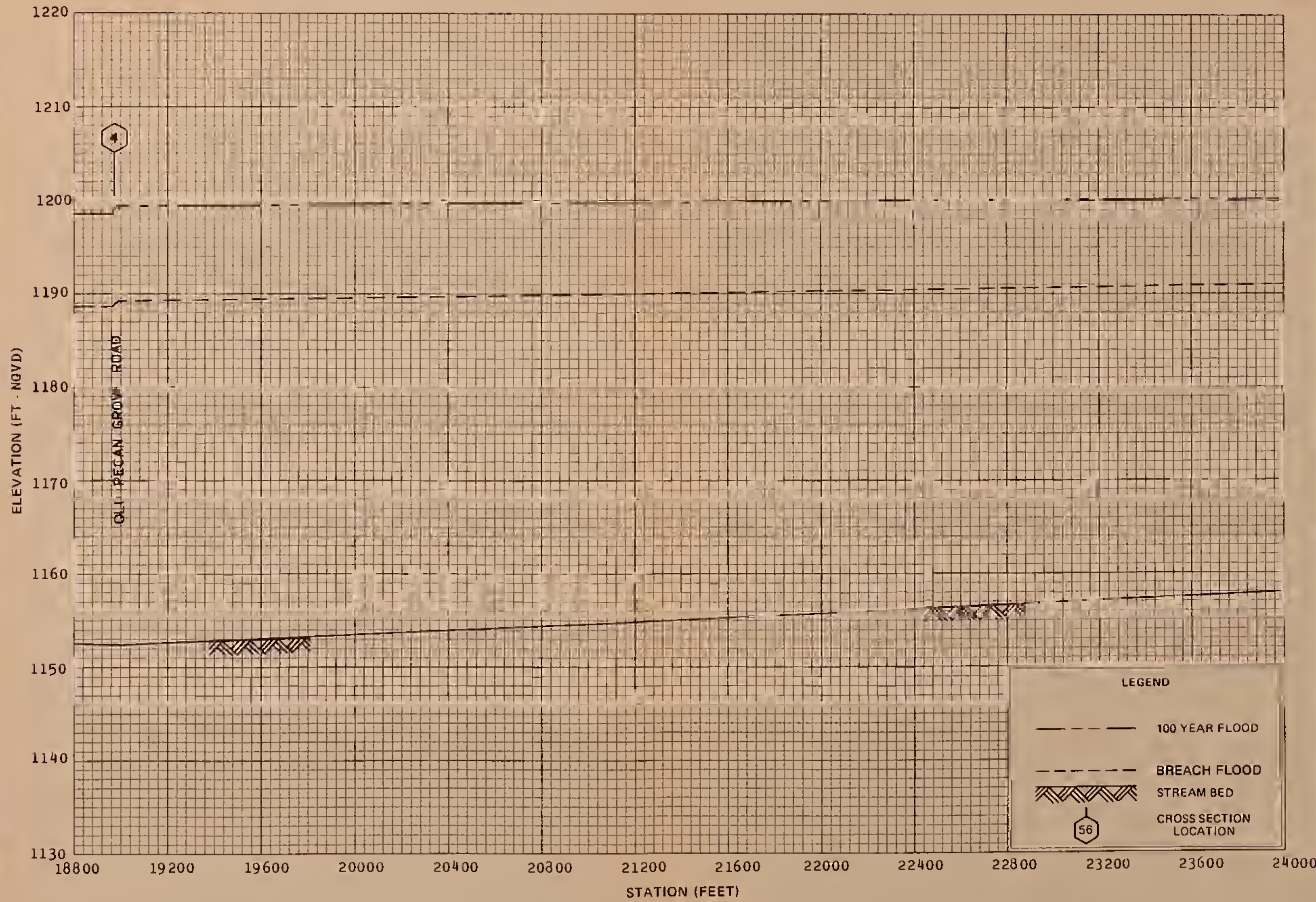


WATER SURFACE PROFILES

BRADY RESERVOIR BREACH

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
LOWER SAN SABA RIVER
FLOOD PLAIN MANAGEMENT STUDY
SAN SABA COUNTY, TEXAS

SHEET 1 OF 9

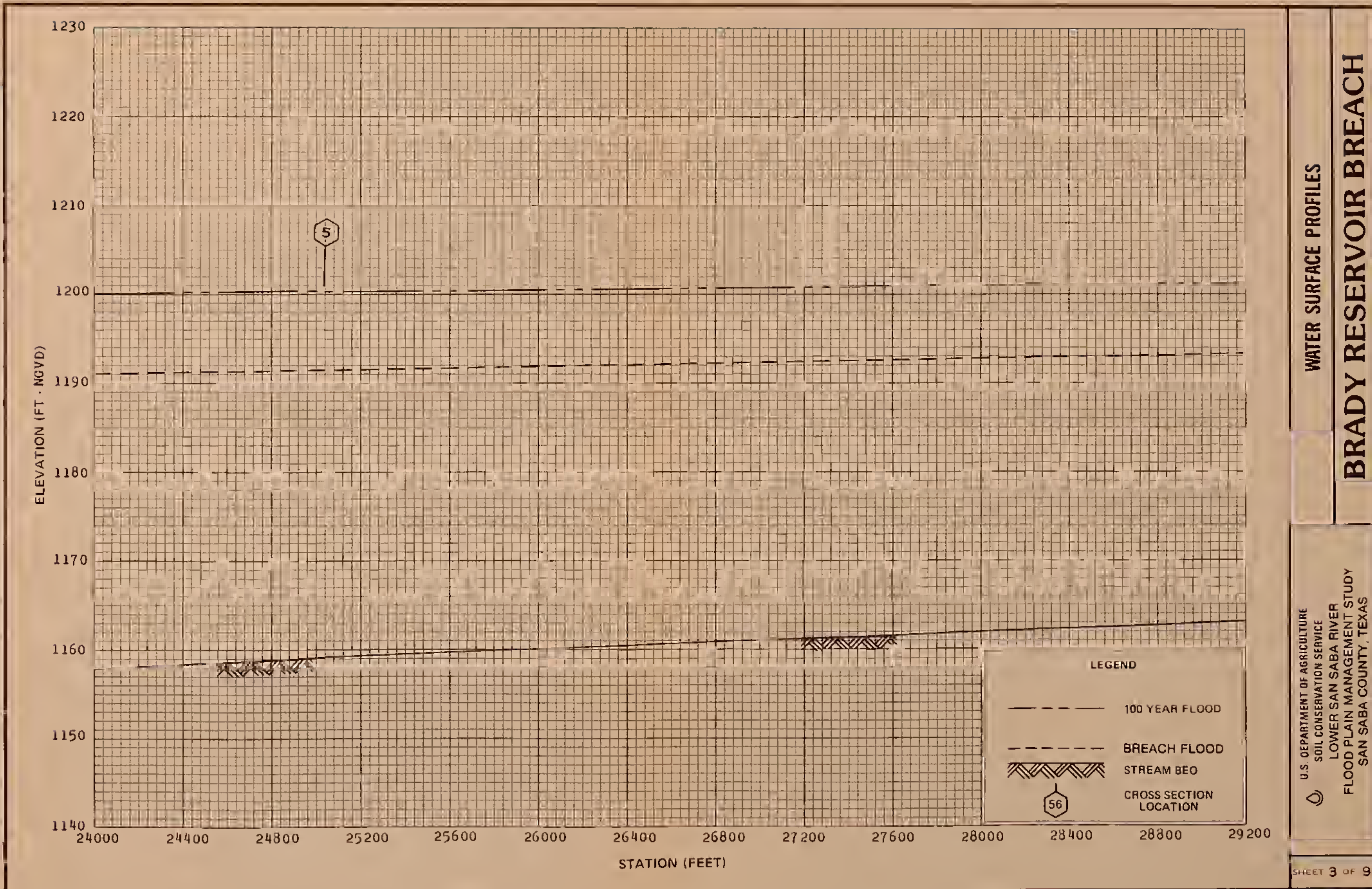


WATER SURFACE PROFILES

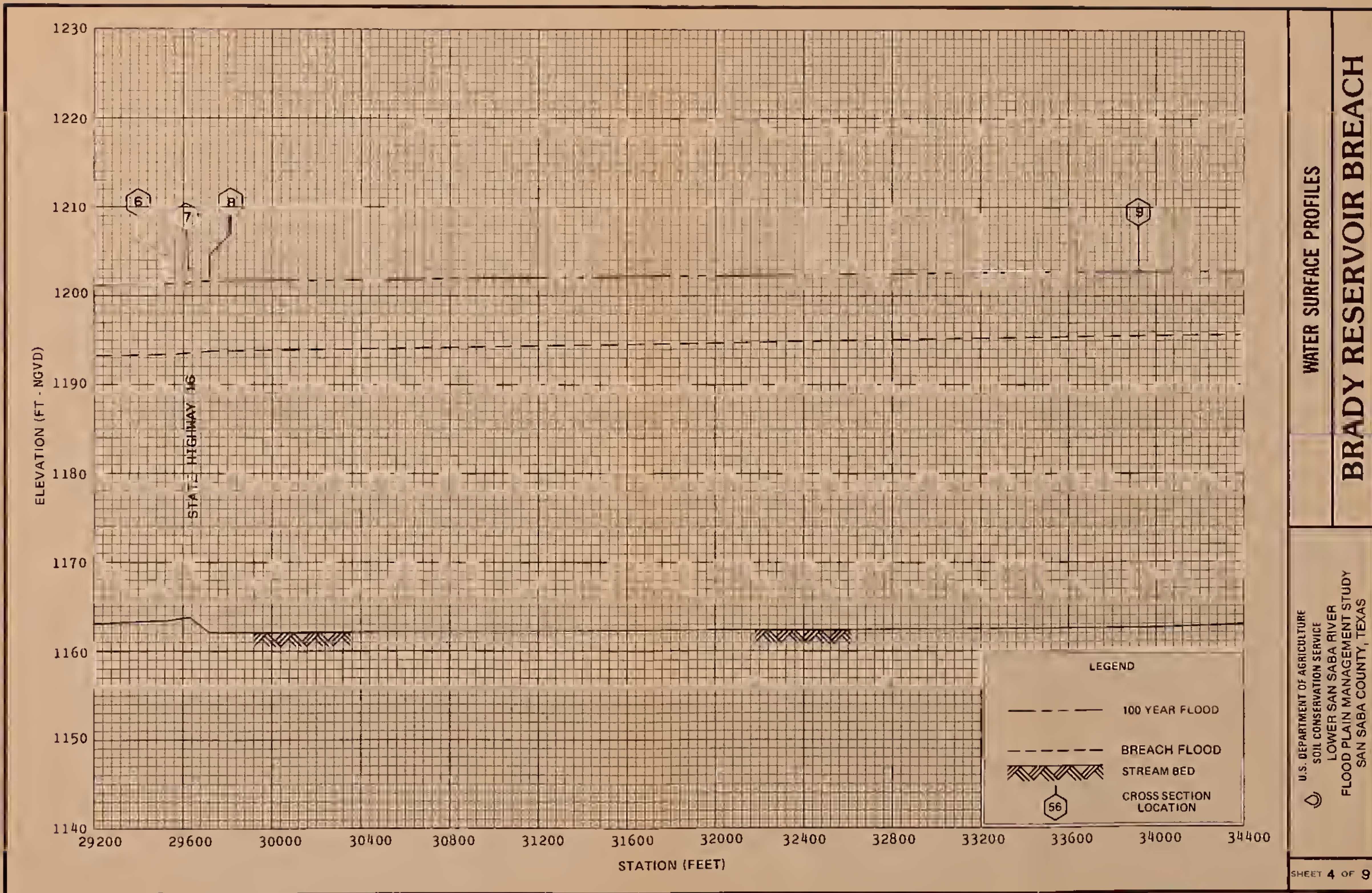
BRADY RESERVOIR BREACH

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
LOWER SAN SABA RIVER
FLOOD PLAIN MANAGEMENT STUDY
SAN SABA COUNTY, TEXAS

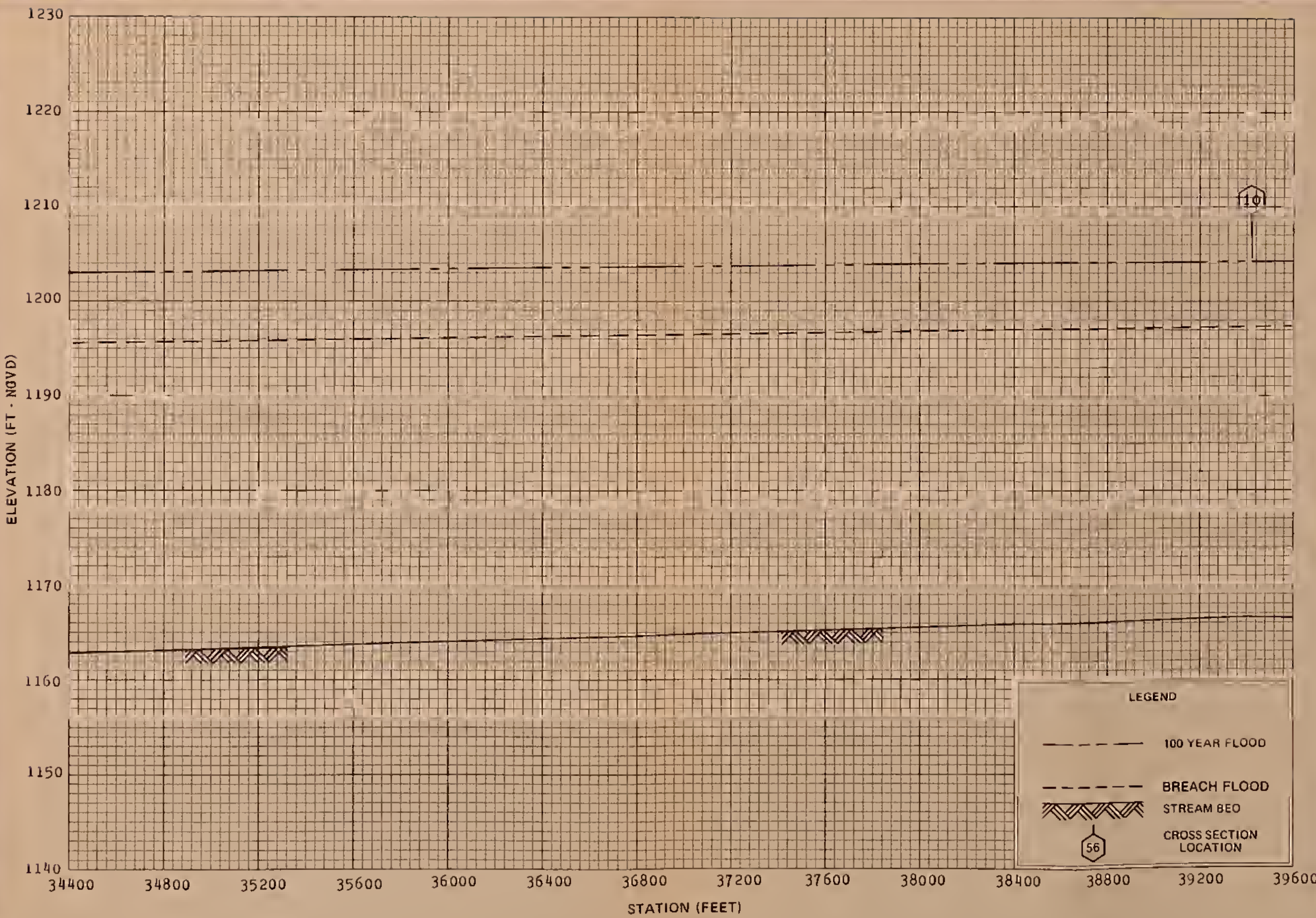
SHEET 2 OF 9



1230
1220
1210
1200
1190
1180
1170
1160
1150
1140
ELEVATION (FT - NGVD)
5
24000
24400
24800
25200
25600
26000
26400
26800
27200
27600
28000
28400
28800
29200
STATION (FEET)
LEGEND
100 YEAR FLOOD
BREACH FLOOD
STREAM BED
CROSS SECTION LOCATION
56
WATER SURFACE PROFILES
BRADY RESERVOIR BREACH
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
LOWER SAN SABA RIVER
FLOOD PLAIN MANAGEMENT STUDY
SAN SABA COUNTY, TEXAS
SHEET 3 OF 9



WATER SURFACE PROFILES
BRADY RESERVOIR BREACH
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
LOWER SAN SABA RIVER
FLOOD PLAIN MANAGEMENT STUDY
SAN SABA COUNTY, TEXAS
SHEET 4 OF 9
ELEVATION (FT - NGVD)
1230
1220
1210
1200
1190
1180
1170
1160
1150
1140
STATION (FEET)
29200
29600
30000
30400
30800
31200
31600
32000
32400
32800
33200
33600
34000
34400
STATE HIGHWAY 16
6
7
8
9
LEGEND
100 YEAR FLOOD
BREACH FLOOD
STREAM BED
CROSS SECTION LOCATION
56

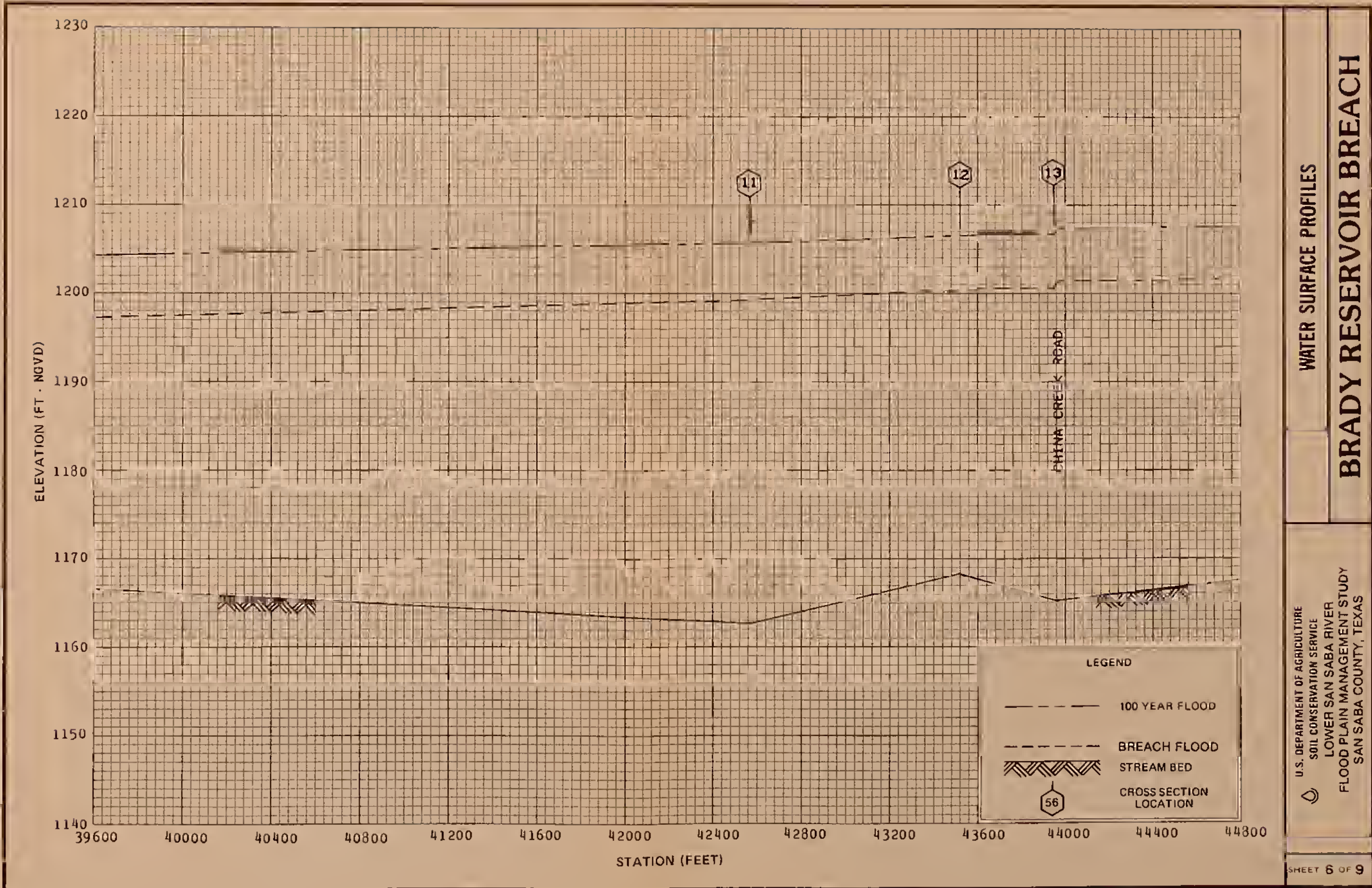


BRADY RESERVOIR BREACH

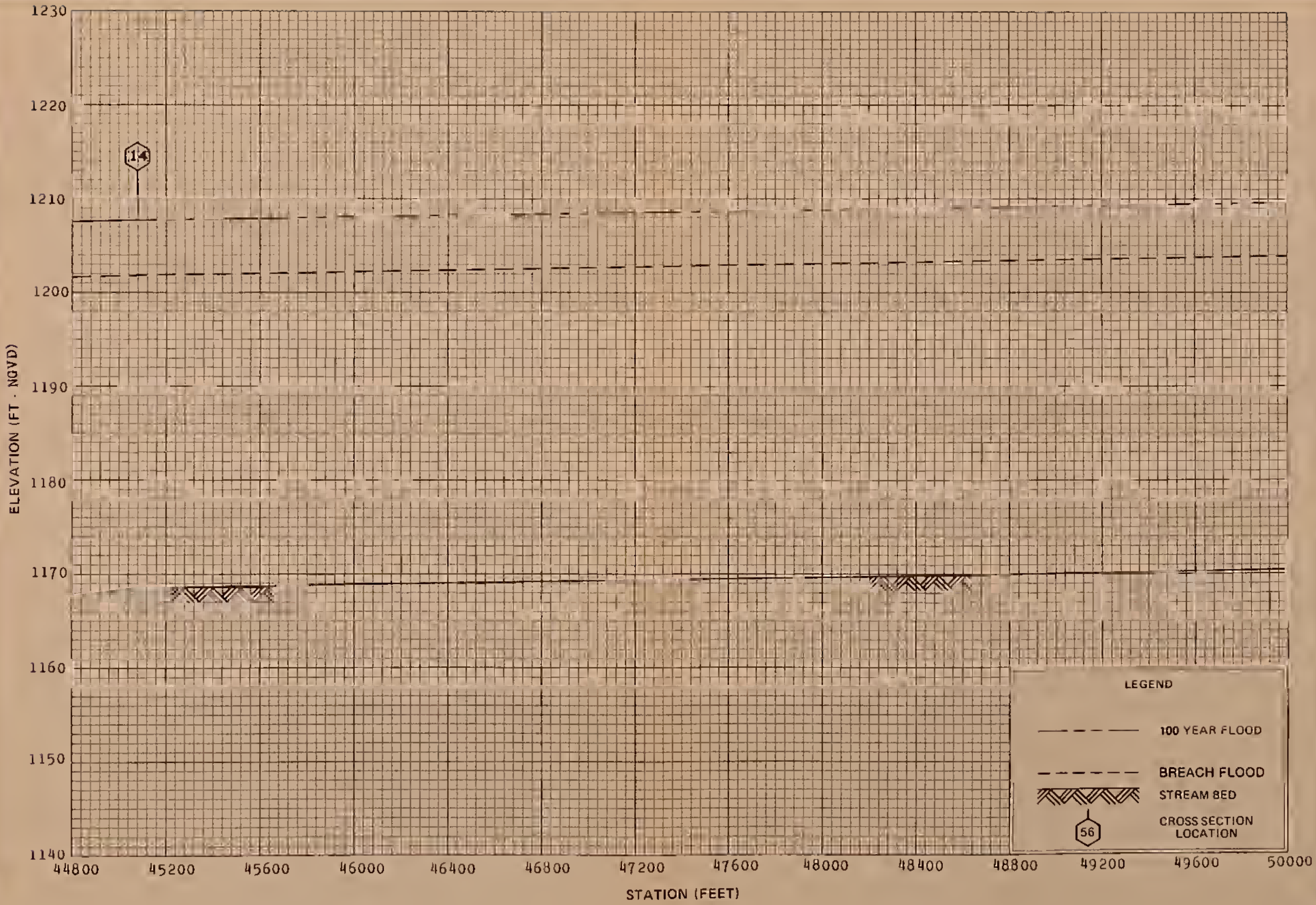
WATER SURFACE PROFILES

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
LOWER SAN SABA RIVER
FLOOD PLAIN MANAGEMENT STUDY
SAN SABA COUNTY, TEXAS

SHEET 5 OF 9



BRADY RESERVOIR BREACH
WATER SURFACE PROFILES
ELEVATION (FT - NGVD)
STATION (FEET)
CHINA CREEK ROAD
LEGEND
100 YEAR FLOOD
BREACH FLOOD
STREAM BED
CROSS SECTION LOCATION
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
LOWER SAN SABA RIVER
FLOOD PLAIN MANAGEMENT STUDY
SAN SABA COUNTY, TEXAS
SHEET 6 OF 9

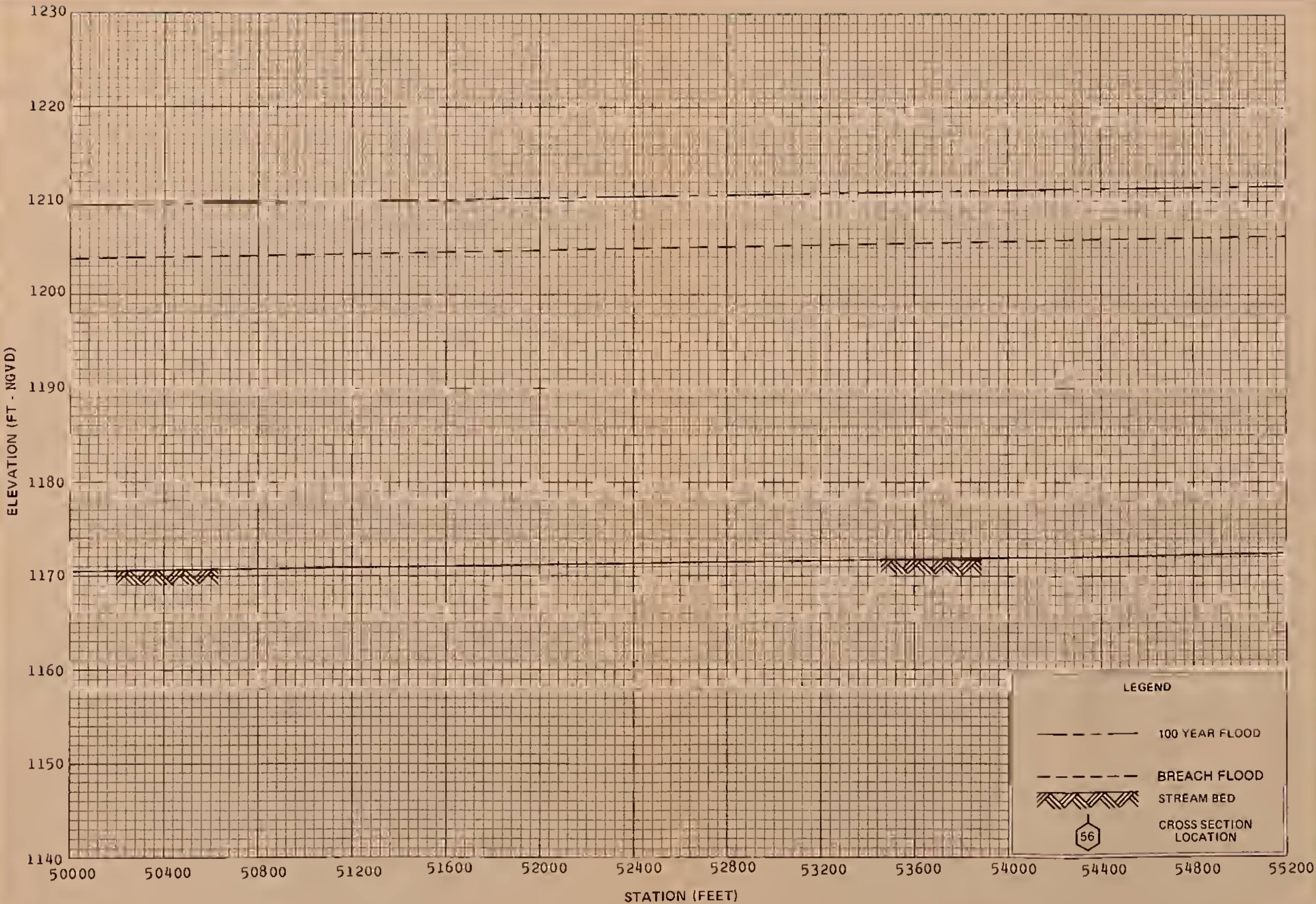


BRADY RESERVOIR BREACH

WATER SURFACE PROFILES

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
LOWER SAN SABA RIVER
FLOOD PLAIN MANAGEMENT STUDY
SAN SABA COUNTY, TEXAS

SHEET 7 OF 9

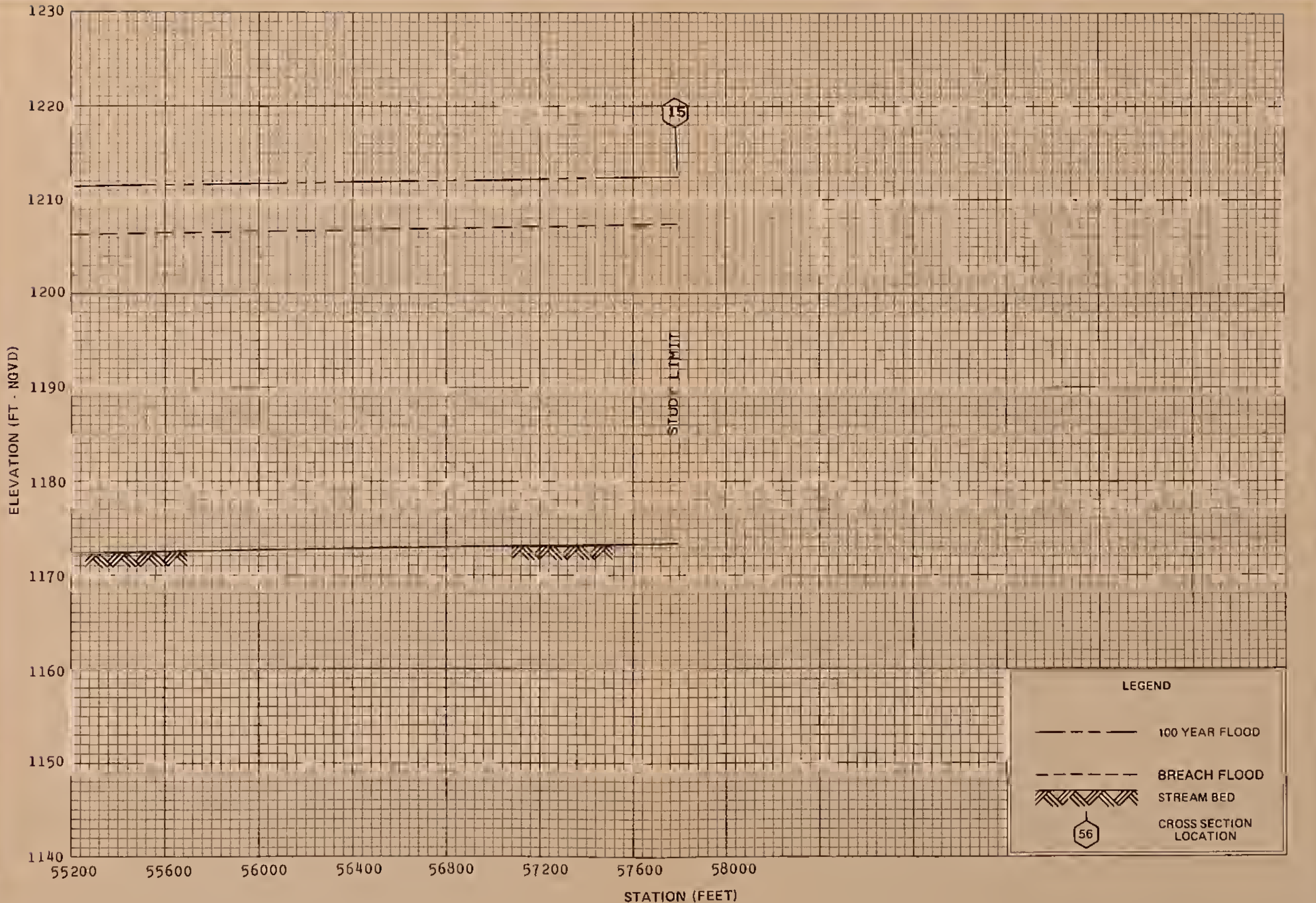


BRADY RESERVOIR BREACH

WATER SURFACE PROFILES

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
LOWER SAN SABA RIVER
FLOOD PLAIN MANAGEMENT STUDY
SAN SABA COUNTY, TEXAS

SHEET 8 OF 9



WATER SURFACE PROFILES

BRADY RESERVOIR BREACH

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
LOWER SAN SABA RIVER
FLOOD PLAIN MANAGEMENT STUDY
SAN SABA COUNTY, TEXAS

SHEET 9 OF 9

TABLE 3

LOWER SAN SABA RIVER FLOOD PLAIN MANAGEMENT STUDY

ELEVATION, DISCHARGE AND TABULATIONS

	10-YEAR			50-YEAR			100-YEAR			~~100~~ 500-YEAR		
CROSS SECTION NUMBER	DISCHARGE CFS	ELEVATION N.G.V.D. FEET	FLOOD PLAIN WIDTH FEET	DISCHARGE CFS	ELEVATION N.G.V.D. FEET	FLOOD PLAIN WIDTH FEET	DISCHARGE CFS	ELEVATION N.G.V.D. FEET	FLOOD PLAIN WIDTH FEET	DISCHARGE CFS	ELEVATION N.G.V.D. FEET	FLOOD PLAIN WIDTH FEET
1	38878	1183.8	1521	106071	1192.5	2101	151301	1196.3	2621	340771	1206.3	3967
2	38883	1185.0	1971	106084	1193.6	2584	151317	1197.4	2908	340791	1207.3	4799
3	38896	1187.0	2423	106111	1194.8	3825	151350	1198.4	5106	340834	1208.1	8213
4	38901	1187.9	2618	106123	1195.6	4747	151366	1199.3	4957	340853	1209.2	6836
5	38904	1190.2	3108	106131	1196.8	5570	151374	1200.2	5742	340865	1209.9	8399
6	38916	1192.2	3778	106168	1198.1	6055	151427	1201.2	6138	340929	1210.6	8300
7	38916	1192.5	4166	106168	1198.4	6081	151427	1201.7	6162	340929	1211.3	8487
8	38916	1192.8	4518	106168	1198.5	6276	151427	1201.8	6387	340929	1211.4	8397
9	38934	1194.3	3567	106213	1199.9	3694	151479	1202.9	5279	340986	1212.3	5869
10	38955	1196.1	4510	106236	1201.2	4813	151504	1204.1	5091	341022	1213.1	5985
11	38967	1198.1	5291	106256	1203.0	5626	151527	1205.7	5830	341047	1214.4	6875
12	38976	1199.2	4491	106271	1203.9	5758	151544	1206.5	5923	341065	1215.0	6957
13	38978	1200.1	4455	106275	1204.7	5983	151549	1207.3	6380	341070	1216.7	7935
14	38979	1200.7	5182	106276	1205.4	5909	151550	1207.9	6163	341071	1216.4	7031
15	39075	1205.9	7544	106498	1210.1	7730	151816	1212.4	7818	341355	1220.0	8460

TABLE 4

LOWER SAN SABA RIVER DAM SAFETY BREACH STUDY

ELEVATION, DISCHARGE AND WIDTH TABULATIONS

	Brady Reservoir Breach		
Cross Section Number	Discharge C. F. S.	Elevation N.G.V.D. Feet	Flood Plain Width Feet
1	46700	1185.3	1470
2	46900	1186.4	2089
3	47300	1188.2	3485
4	47300	1189.1	2718
5	47300	1191.4	5058
6	49100	1193.3	5896
7	49100	1193.6	5883
8	49100	1193.9	6027
9	50200	1195.4	3591
10	51600	1197.1	4557
11	52400	1199.2	5396
12	52800	1200.3	4547
13	52800	1201.2	4574
14	52800	1201.9	5439
15	52200	1207.2	7614

TABLE 5

BENCH MARK DESCRIPTIONS AND ELEVATIONS

FLOOD PLAIN MANAGEMENT STUDY, DAM SAFETY

BREACH STUDY

LOWER SAN SABA RIVER

SAN SABA COUNTY, TEXAS

Flood Hazard Area Sheet Number	RM Name	Elevation Feet, N.G.V.D.	Description
5, 6, 9, 10	San Saba	1206.52	A standard U.S.C. and G.S. disk in a post in the northwest corner of the lawn at the Courthouse in San Saba. Mark is 48 feet northwest of the northwest corner of building, 6 feet southwest of center of walk, 1.5 feet west of southwest corner of stone war memorial.
5, 6, 9, 10	R-340	1205.69	A standard U.S.C. and G.S. disk in the top of the west of the northwest concrete leg of the water tower in San Saba.
11	RM5	1201.90	An 8" spike in the west face of a pole about 1.2 miles northwest of Courthouse at San Saba where China Creek Road crosses the San Saba River, 20 feet north of the northwest corner of the bridge.
9, 10, 12	RM6	1219.21	Scratched "X" on the southwest bolt of a fire hydrant northeast of intersection of West China Creek Road and North Hope Street, about 0.5 mile northwest of Courthouse.

TABLE 5

BENCH MARK DESCRIPTIONS AND ELEVATIONS

FLOOD PLAIN MANAGEMENT STUDY, DAM SAFETY

BREACH STUDY

LOWER SAN·SABA RIVER

SAN SABA COUNTY, TEXAS

Flood Hazard Area Sheet Number	RM Name	Elevation Feet, N.G.V.D.	Description
9, 10, 12,	RM7	1224.54	Scratched "X" on the west rim of sewer manhole just east of center line of intersection of North Fentress Street and Brown Street.
9, 10	RM8	1220.96	A chiseled square in the top of the curb east of the fire hydrant in the northwest quadrant of the intersection of South 8th Street and West Commerce Street.
6, 10	RM9	1213.30	A railroad spike in the north face of a pole in the southwest quadrant of the intersection of High Street (State Highway 16) and East Annex Street.
5, 6	RM10	1189.33	A chiseled square on top of curb at southeast corner of concrete walk to front door of residence on the north side of U. S. Highway 190. Residence is a one story pink brick house that is 200 feet west of the J. H. "Shorty" Brown Cemetery and about 0.55 mile east of Courthouse.

TABLE 5

BENCH MARK DESCRIPTIONS AND ELEVATIONS

FLOOD PLAIN MANAGEMENT STUDY, DAM SAFETY

BREACH STUDY

LOWER SAN SABA RIVER

SAN SABA COUNTY, TEXAS

Flood Hazard Area Sheet Number	RM Name	Elevation Feet, N.G.V.D.	Description
8, 9, 11, 12	RM11	1201.70	Scratched "X" on the top bolt of a fire hydrant in the northeast quadrant of the intersection of North 9th Street and West Gunter Street.
9	RM12	1202.73	Scratched "X" on the south bolt of a fire hydrant in the northeast quadrant of the intersection of North 6th Street and West Lewis Street.
1, 4	RM13	1215.70	An 8" spike in the west face of a telephone pole in the southwest quadrant of Old Pecan Grove Road and a private driveway to the southeast; about 0.8 mile northeasterly along Old Pecan Grove Road from the bridge crossing at the San Saba River; about 1.2 miles northeast of Courthouse.
4, 8	RM14	1205.92	A chiseled square on the north end of the west wheel guard at abutment of State Highway 16 bridge over San Saba River.

TABLE 5

BENCH MARK DESCRIPTIONS AND ELEVATIONS

FLOOD PLAIN MANAGEMENT STUDY, DAM SAFETY

BREACH STUDY

LOWER SAN SABA RIVER

SAN SABA COUNTY, TEXAS

Flood Hazard Area Sheet Number	RM Name	Elevation Feet, N.G.V.D.	Description
1, 4	RM-15	1215.70	An 8" spike in the west face of a telephone pole in the southwest quadrant of Old Pecan Grove Road and a private driveway to the southeast; about 0.8 mile northeasterly along Old Pecan Grove Road from the bridge crossing at the San Saba River; about 1.2 miles northeast of Courthouse.
4,8	RM17	1205.92	A chiseled square on the north end of the west wheel guard at abutment of State Highway 16 bridge over San Saba River.
4, 8	RM18	1194.21	A chiseled square on the north end of the west wheel guard of State Highway 16 bridge 900 feet north of the San Saba Cemetery and 0.5 mile south of the San Saba River bridge.